YOUR AMAZING EYES

Powerpoint Presentation

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TITLE SLIDE

Eyes are thought to have first developed in animals, in a very basic form, around 550 million years ago. Since then, they have become the second most complex organ after the brain. We hear all the time about the wonderful ways our brains work for us, but our eyes sometimes don't get the respect they deserve.

You know, we don't actually see with our eyes. We see with our brains. But our eyes are awfully handy for looking around, and they're pretty amazing little organs. So here is what I'm going to talk about for the next half hour:

SLIDE: Lesson outline:

--How is your eye built?

--Fascinating facts

--Interesting trivia

--How a baseball player sees a fastball

--Discussion

SLIDE: EYE ANATOMY

Your eye is composed of more than 2 million working parts. Those directly responsible for seeing are your retina, optic nerve, iris, lens, and cornea. All of those seeing parts work together to capture images as electrical data and transmit them to your brain. That is where the data is translated into what we call eyesight, then interpreted and stored in your memory. So, actually, you may be looking with your eyes, but you're seeing with your brain.

SLIDE: RETINA

Your retina, which receives and processes light, is like wet seven-layered tissue paper lining the inside back of your eyeball. It contains about 107 million light sensitive cells. Some 7 million cone cells, which help you see color and details, are packed into the center of your retina. That’s the macula. About 100 million rod cells, which help you see in the dark, are found mostly outside of the macula.

Because of the shape of your eye's lens, your retina actually perceives images upside down. In addition to being upside down, images arrive at your retina split in half and distorted. Fortunately, this is all sorted out by your brain before you realize what you’re looking at.

SLIDE: RETINA ANGIOGRAM

Your retina is connected to your brain by your optic nerve, which is actually a bundle of more than a million nerve fibers enclosed in a protective sheath--like electrical wires in a conduit. Each eye has a small natural blind spot off to the side where the optic nerve enters, but it’s not a problem, because your brain uses the information from the other eye to fill the gap.

SLIDE: STEREO VISION

Two eyeballs give you stereoscopic, 3D vision, allowing you to to separate images from the background, something we call depth perception. There are, however, other ways to perceive depth. Slightly rotating your head side to side, for example, will achieve the same purpose. Not very helpful while playing ping pong, but useful when viewing a stationary scene.

SLIDE: Taylor Swift's eyes

Who is this?

SLIDE: Full head shot

How could you tell?

SLIDE: IRIS/CORNEA/LENS/PUPIL

Your iris is the colored part of your eye that has inspired many songs (“Five Foot Two, Eyes of Blue”, “Green Eyes”, Don’t it Make My Brown Eyes Blue”, “Blue Spanish Eyes”, and “Beautiful Brown Eyes”, to name just a few). Like the shutter of a camera, your iris opens and closes to allow more or less light to shine through your pupil and onto your retina. While your fingerprint has 40 unique characteristics, your iris has 256. For that reason, eye scans are increasingly being used for security purposes.

A flexible lens at the front of your eye focuses the light from images onto your retina. If the muscles connected to the lens are working properly, and if the lens remains clear and flexible, focusing is as automatic as breathing. The lens is protected by the clear covering of the cornea, which, interestingly, is the only human tissue that doesn't contain blood. Your cornea is kept safe and healthy by your eyelids, tears, and eyelashes. At the same time, your eyelids, iris, and eyebrows help protect your retina from uncomfortably bright light.

SLIDE: CLOSEUP OF EYE

So our eyes are perfectly suited to our visual needs, and we certainly put them to the task. In the average lifetime, human eyes will see up to 24 million different images. They are on call 24/7, and, if they are genetically sound and continually well maintained, they should last a lifetime. Unfortunately, due to progress in medical science, many humans are now outlasting the eyeball’s built-in life span, which means that visual impairment is becoming increasingly more common in older people.

Knowing all of this ought to give us a healthy respect for our amazing eyes. But if that's not enough, here are some more facts that I hope you will find interesting.

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SLIDE: [BLINKING]

Eyelid blinking is an unconscious activity that helps keep your eyeballs moist and clean. On average, you blink 17 times a minute, but it’s possible to blink five times in a single second.

Did you know that . . .

You blink an average of 4,200,000 times a year?

You blink more when you talk--and even more when you lie?

Your average blink lasts for only about 1/10th of a second?

You spend about 10% of your waking hours with your eyes closed from blinking?

Your eyes become tired when you read or stare at a computer? That's because you tend to blink less often. It is, however, not your eyeball that is tired. It is actually the muscles and tissues surrounding it that grow weary from over-use.

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SLIDE: PHOTO MONTAGE OF EYE COLORS

What color are your eyes?

If they’re brown, you are in the vast majority.

Blue-eyed people share a single ancestor with all other blue-eyed people around the world. All humans originally had brown eyes, but a genetic mutation about 6,000-10,000 years ago caused a person living near the Black Sea to lack enough melanin in his or her iris, which created the first case of blue eyes. Blue eyes exist under all brown eyes, but that person’s iris color simply did not fully develop.

The blue eye mutation seems to be disappearing. About half of Americans born at the turn of the 20th century had blue eyes; but today only about 1 in 6 Americans has them. And that's not bad news, because blue eyes tend to be more sensitive to light and less resistant to the damage it can cause. Blue-eyed people, for example, are more at risk of developing macular degeneration and need to take extra precautions.

Incidentally, if your eyes are green, you are in a tiny minority. It is estimated that only 2% of all humans have green eyes, making it the rarest eye color. That’s because, to create a green-eyed baby, a person with rare blue eyes would have to hook up with a person with even more rare green eyes.

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SLIDES (7): “EYE TRIVIA”

And here, just for fun, is some random interesting trivia that you may or may not have heard:

Under the right conditions and lighting, humans with normal vision can see the flame of a candle from 14 miles away.

It takes only about two-tenths of a second for your brain to perceive an image seen by your eye. That's why, when something happens quickly, we say "in the blink of an eye".

Your eye is constantly making tiny jerking movements called “microsaccades” to stop images from fading away. You will notice this if you try to hold your gaze perfectly still while fixating on a point in space.

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A healthy eye can distinguish approximately 1,000 shades of color, and it can identify over 10 million colors under a single viewing condition. Crayola has a long way to go in naming all of those!

Dogs are the only non-human species known to read your emotions by looking at your eyes. Cats might be able to learn how, but I don’t think they care.

Each of your eyelashes has a life span of about 5 months, and the total length of all eyelashes shed by you in a normal lifetime will be over 98 feet.

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Everyone has one eye that is slightly stronger than the other. This so-called "dominant" eye is responsible for most visual input to your brain. If you have enough central vision in both eyes, you can discover your eye dominance by first forming a circle (like the hand signal for “okay”) with the thumb and index finger of either hand, then peer through the circle at an object in front of you and slowly move the circle toward your face while keeping the object in sight. The eye your fingers encircle is probably your dominant eye.

People with right-eye-dominance are normally also right-handed, and vice versa. If you are right-handed and left eye dominant, or left-handed and right eye dominant, you may be cross-dominant—-a condition that can cause developmental difficulties in children.

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Like your skin, your eyes can get sunburned. They will usually recover within a couple of days, but over-exposure to the sun over time can also damage your retina, and that will not recover.

Contrary to an old wive’s tale, it is possible to sneeze with your eyes open. But don't worry about sneezing your eyes out. Can't happen.

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Reading in dim lighting does not damage your eyesight, any more than listening to soft music will damage your hearing. You could, however, develop temporary eye strain from insufficient lighting.

If you are near-sighted, gently pulling back on the corners of your eyes can help you focus. This slightly changes the shape of your eyeballs, thus altering the focal point of the light rays on your retinas.

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Another way to improve your focus is to gaze through a pin hole. This reduces the blur around an image, making it clearer. If you have central vision in at least one eye, you can make a quick pinhole viewer by forming the “okay” sign with both hands and touching your joined fingertips together.

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About 80% of a sighted person's sensory input is received through the eyes. If the eyes stop working, however, most of that can be handled by one or more of the other four senses. Many people around the world are dealing with this, including about 39 million who are blind and roughly 6 times that many who endure some kind of vision impairment.

In the U.S., inherited forms of retinal disease affect approximately 200,000 Americans, whereas age-related macular degeneration affects 5 million to 10 million Americans.

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The good news is that 80% of vision problems worldwide are avoidable or even curable. Many problems can be avoided by a lifetime of following good health and eye safety practices. Others are now being cured through surgeries and drug interventions. The most difficult conditions are those that are genetic, but science is making important strides toward eliminating those causes in the foreseeable future.

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A while back, I read an article online that I think you might find interesting. In it, the author explains the astounding partnership of the eyes and brain of a batter in the game of baseball. The title is:

SLIDE: TITLE WITH BASEBALL PITCHER GRAPHIC

HOW BASEBALL PLAYERS SEE A FASTBALL

"Major League pitchers have an arsenal of weapons – the curveball, change-up and slider. But, the most feared pitch is the one every Ace must possess, the fastball. Timed at 90 miles per hour and up, it’s hard to imagine how to see a baseball going at that speed, much less hitting one.

"How can a batter hit a baseball traveling at over 90-miles per hour? Here's how it happens:

SLIDE: TEXT GRAPHIC

"A fastball travels to home plate in approximately one-third to one-half of a second, let’s say 500 milliseconds. By comparison, an eye blink takes about 300 to 400 milliseconds.

SLIDE: TEXT GRAPHIC

"The batter’s brain takes about 100 milliseconds to process the image of the ball coming toward him. He will need about 125 to 225 milliseconds to decide to swing. If he decides to do so, it will take 25 milliseconds for his brain to tell his body to move. Then, it will take about 150 milliseconds to swing the bat and make contact with the ball.

SLIDE: BATTER DRAWING

"Breaking it down like this shows how miraculous it is that anyone hits a fastball. Which characteristics or talents do they possess – great eyesight, reaction time, baseball eye training or something else — that allows them to see and hit the ball?

"Certainly, eyesight makes a difference on how to see a baseball. For that reason, MLB scouts look for players with outstanding eyesight, specifically 20/12 vision. It makes sense that the clearer and stronger the eyesight, the better the ball can be seen.

"But if the ball is going 100-miles per hour, it travels approximately 3 feet by the time a batter recognizes that there is a ball and 15 feet by the time he decides to swing. So, as he is swinging, his body is acting on old information, which should make it impossible to hit a fastball.

SLIDE: BATTER DRAWING

"The only answer would be that the brain must have some kind of mechanism allowing the hitter to know ahead of time what the ball is going to do. Well, vision scientists at the University of California, Berkeley, have identified a portion of the brain that does just that. This prediction mechanism is located in the brain's visual cortex. It tracks the trajectory of moving objects, even if an object is traveling at unbelievably fast speeds. In effect, said the researchers, the image that hits the eye, and is then processed by the brain, is not in sync with the real world, but the brain is clever enough to compensate for that."

SLIDE: Title page

The seemingly impossible, therefore, becomes possible thanks to the highly complex partnership of the human eyes and brain. And the benefits of such a partnership extend well beyond hitting fastballs. The human eye is one of the most intricate living organs on Earth. Yet, we can easily forget about our astounding gift of sight until we lose it all or in part.

But what if we do lose our eyesight? Can we live without it?

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END POWERPOINT FOR DISCUSSION

I said earlier that 80% of our sensory input comes through our eyes, but it doesn't have to. Our other four senses can be taught to substitute for eyesight.

DEMONSTRATE:

Search with hands in book bag

"Follow my voice"

A motivated patient participating in a good low vision rehabilitation program can conceivably preserve or restore 99% of all independent activities of daily living lost to poor vision.

Technology is making dependence upon eyesight less important:

Audio books

Descriptive movies and plays

Talking devices, eg. currency and color identifiers

Text-to-speech software, eg. reading machines, talking computers

GPS and Indoor navigation technology

Artificial Intelligence (AI), eg. Seeing AI

What's left for the eyes?

Name a normal ADL that cannot be accomplished without eyesight. (Does not include employment.)

Living well with little or no vision is not easy, but with tenacity, adaptability, support, and knowledge (TASK), it's possible.

In the meantime, science is moving forward to find treatments and cures through genetic replacement therapies, stem cell transplantation, and medical interventions.

The human eyeball, for example, cannot yet be transplanted, but some of its parts can be repaired. A lens can be replaced with a plastic one, a cornea can be transplanted, and a torn retina can be fixed. These are wonderful contributions from medical science, but we are challenged to make our eyes stay in good working order by way of common-sense safety practices, healthy behavior, and regular check-ups.

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SLIDE: SOURCES:

14 Unbelievable Facts About The Human Eye

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Eyes: 15 Facts You Probably Didn't Know About Them

<https://www.vsp.com/eyes.html>

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