But Why: A Podcast for Curious Kids

**Why do we need glasses?**

February 9, 2023

**Jane** 00:20
This is But Why: A Podcast for Curious Kids, from Vermont Public. I'm Jane Lindholm and I host this show. On But Why, we take questions from curious kids all over the world and we find interesting people to answer them. In our last episode, we started learning all about how our eyes work, and if they're actually shaped like balls! And as we were making the episode, I got an eye exam from a pediatric ophthalmologist, a specialized eye doctor for kids, named Sujata Singh. Dr. Singh is back for this episode, and today we're going to learn a little bit more about the ways glasses can help some of us see better. Did you know that one out of every four kids in the United States wears glasses? Sometimes, instead of glasses, as people get older, they choose to wear small flexible lenses called contact lenses that actually fit right over and on top of your eyeball. Are you one of the many people who need glasses? I am. I started wearing glasses in high school and the two other people who make But Why with me, Melody Bodette and Kianna Haskin, also started wearing glasses when they were kids. Given how many people use glasses to help make sure we can see clearly, it's not a surprise that you've sent us a lot of questions on this topic.

**Tommy and Audrey** 01:35
My name is Tommy and I'm five years old. My name is Audrey. I'm eight years old. And we live in they live in Minnesota. And our question is, why do I need glasses...and I don't?

**Georgia** 01:53
Hi, my name is Georgia. I'm 10 years old, and I live in Charlotte, North Carolina. My question is why do people wear glasses?

**Timothy** 02:03
Hi, my name is Timothy. And I'm four years old. And I live in Wisconsin. And my question is, how can people see so well without glasses or contacts?

**Benjamin** 02:16
My name is Benjamin. I'm seven years old and I live in Newton, Massachusetts. Why do some people wear eyeglasses and some people don't?

**Maren** 02:25
Hi, my name's Maren. I'm six years old. I'm from Holly, Michigan. And I wonder how do glasses help you see.

**Maisie** 02:36
Hello, my name is Maisie and I am six years old. I'm from Haley, Idaho. My question is how to glasses help you see?

Jane 02:44
Ella, who's five and lives in Australia also had this question. Why do some people need glasses? People often need glasses to correct blurry vision. For some folks, things that are close up look blurry. That's called farsightedness. For other people, things that are far away look blurry. That's called nearsightedness. The things you're trying to look at look blurry because of the way the light entering your eye hits the back of your eyeball. If the curvature at the front of your eye or the length of the eye isn't exactly right, the images can be out of focus. Glasses help correct that so the images are sharp.

Jane 03:26
Your eyesight can change over the course of your lifetime. So even if you don't have glasses now, you might need them someday. Or you might need a different prescription as you get older. And some people who have glasses as kids don't always need them as adults. Dr. Singh says fuzzy vision isn't actually the only reason, though, that people use glasses.

Dr. Sujata Singh 03:47
That's just one thing glasses does is make the images more clear for for you to be able to interact with the world and enjoy enjoy life. And also for little kids to learn how to see as best as they can. But another thing that it can do is help realign your eyes. So one thing that little kids do that adults don't tend to do is when they are really farsighted--meaning they have a high glasses prescription--they want to see clearly, they focus really hard, they are really good at focusing, and so they focus really hard. When you focus, your eyes cross inward. So you can see that when you try to look at your finger, your eyes will--up close to your face--your eyes cross in.

Jane 04:27
Right. If you take your finger and you bring it closer and closer and closer to your nose, you can get your eyes. It's a trick that a lot of us do when we're kids like look, I can get my eyes to cross.

Dr. Sujata Singh 04:35
Yeah, exactly. Yeah. And then they come here and we try to sort it out. And so you can use that same mechanism to try to clear up your images if you're really farsighted. And so what we can do is just give you the glasses so then you don't have to focus and your eyes get straighter. So that's another thing like glasses can do so. Yeah.

Jane 04:54
Okay, so now we know why people need glasses. But how do they work?

Adilyn 04:59
Hi My name is Adilyn. I live in Layton, Utah. My question is, how do eyeglasses work?

Kaitlyn 05:05
Hi. My name is Kaitlyn. I'm seven years old, and I live in San Antonio, Texas. My question is, how do glasses help us see better?

Jane 05:16
Simply put, glasses correct for the shape of your eye to make sure the light is focused in the right way when it hits the back of your eyeball. The shape of the lens on the glasses helps bend the light differently. So it hits the correct part of your retina at the back of your eye. But lenses aren't one size fits all. Your eye doctor needs to figure out exactly what kind of lens is right for you.

Dr. Sujata Singh 05:42
I pull out all of these lenses. And I have a lot of them. I forget how many probably a couple hundred.

Jane 05:48
Woah, this is really cool! So can we describe? You pulled out a drawer, a hidden secret drawer right here in the office. And it looks like these, like, rings, it looks like black rings and red rings. But they are filled with glass, which I assume is glass that would be like what I might have in my glasses, but different kinds depending on what kind of glasses someone needs.

Dr. Sujata Singh 06:12
Yes, exactly. Yeah, you've described it really well. So they help you. You'll see on the center row here, there's all different numbers. These are called what's called diopters. So it basically tells us the different curvatures and thicknesses of the lenses. So this is, for example, a 20 diopter lens. And you can see how thick and curved it is in the center, compared to a plus one diopter lens. So very different.

Jane 06:37
The plus one diopter lens looks pretty flat. And the other one I can't remember what number you said that was, plus 20, is almost--it's not a circle, but it's like pretty curved.

Dr. Sujata Singh 06:47
Yeah. And it's pretty heavy, too. And it's it's thicker in the center than in the in the edges. And so that changes how the light passes through it right? Like it makes everything upside

Jane 06:58
You're upside down!

Dr. Sujata Singh 06:58
Yeah, exactly. So that's because light is bending through it differently than light is bending through the plus one. And so in comparison and contrast is the minus 20 lens. So you can tell me how it's different, right?

Jane 07:12
That one kind of curves in rather than curving out.

Dr. Sujata Singh 07:16
Yeah, yeah. So the center is thinner than outside.

**Jane** 07:19
And we call those concave and convex. Convex curves out; concave curves in.

**Dr. Sujata Singh** 07:25
Yeah, exactly. And so you can see how it also is different, right. And so I want to make sure that I give you the right curvature, the right size lenses. And so when I shine this light into your eye, the retinoscope into your eye can see that the light is moving in a different way, depending on what your eyeball is doing to the light that I'm passing through. So and then I want to neutralize it, meaning I want that light to stop moving. And so I have to--this is what I trained to do is I spent a lot of time figuring out what is the best lens that will stop that movement. And so that looks very close to right up there.

**Dr. Sujata Singh** 07:26
So what you did was take one of those rings with the glass in it, one of the lenses and put it up to my eye and then use your instrument to still shine the light into my eye. And what you're checking is when it gets just right, that's probably the glasses that I need.

**Dr. Sujata Singh** 08:21
Yes, exactly. Yep. And then we just kind of keep doing that until we find the right, right prescription. Right here. That looks about right. Yep. So and then I can, you have to do a little bit of math to figure out the right prescription after that.

**Jane** 08:42
Cause you have a red one and a black one. And so now you have to figure out between the two of them what my actual prescription is. So you need you actually need both of those.

**Dr. Sujata Singh** 08:50
Yes. So basically, there's a different, there's another kind of lens out there, that is called astigmatic lens, meaning there's a, it's shaped so that you have a thicker center, and a thinner 90 degrees away from it, it's thinner. So you can see how that is different. So your eyeball is made up with two different curvatures in different directions. Some eyeballs are made up with the same curvature in every direction. So the same curvature in every direction looks like this, where it's not thicker in one direction compared to the other. And that's called a spherical lens. So that's more like shaped like a baseball where, if you look at a baseball, no matter which way you rotate it, it's the same curvature. Whereas the football, if you look at it with the points, you know, from side to side and then rotate it so one point is coming toward you, you can see that the curvature the football is different. In one way it's more steep than the other and so that's how we describe the football is the astigmatic lens and the baseball is a spherical lens. And so your eyes are have two different--your cornea like we're talking about and lens, the whole optical system, has two different curvatures. Once we neutralize those curvatures, that will give you the best glasses, the best vision. So you look like you're probably -350, kind of +350 at 180. That's your prescription.

**Jane** 10:20
Cool. All right, now I know. And I think if this is confusing, the thing that's important to remember is that our eyes are all different. And so the way we see is different, but there are some ways that doctors like Dr. Singh can say, "Oh, I understand how to make this better for you." And so it might just be that you have trouble because your eyes shaped a little differently than an optimal eyeball for seeing far and close. And so I don't need to know all of the different ways that eyeballs are shaped or all of the different ways that I can see differently. But it's helpful for you to know that so you can help me see everything that I need to see.

Dr. Sujata Singh  10:57
Yep, exactly.

Jane  10:58
In just a minute, we're going to hear from a kid who has what's called low vision, where things are really blurry sometimes even when she uses glasses. But she has learned other ways to navigate the world. Because even though she sees things a little blurry, she gets around just fine.

BREAK  11:13
BREAK

Jane  11:14
This is But Why: a Podcast for Curious Kids. I'm Jane Lindholm. Today we're learning about glasses and eyes with Dr. Sujata Singh. She's a pediatric ophthalmologist. And let's talk now with someone else. Well, two people, actually.

Maggie  11:29
My name is Maggie. I'm 6 years old. And I live in St. Albans, Vermont. And also, I was born with albinism.

Katie  11:41
Do you know what albinism means?

Maggie  11:44
Well, albinism means there's no color of my skin or my hair.

Katie  11:50
And what else does it does it impact?

Maggie  11:53
How about you whisper it first.

Katie  11:54
You were gonna say "it impacts how I see."

Maggie  11:57
So it impacts how I see.

Jane 12:00
We know Maggie because her mom, Katie, works with us at Vermont Public, where we make But Why. Maggie is a big But Why fan and agreed to talk a little bit with her mom about how she sees. Maggie has a condition called albinism, and, as she just explained, people with albinism have less or no melanin or pigment. Melanin is important not just for your hair and skin color, but also for your optic nerves and how your retina, the back part of your eye, is formed. And because people with albinism often don't have a lot of color in their irises, the part of your eye that can be brown or blue or hazel, people with that condition are often really sensitive to bright light. For Maggie, sunglasses can help block out some of that bright light and corrective lenses--glasses--can help her see better, but they don't make her eyesight perfect.

Katie 12:58
So tell me a little bit about how you see, Maggie, because you see a little bit different than other people, right? What does it look like when you take off your glasses?

Maggie 13:06
Well, when I take off my glasses, I can just bump into things and see everything foggy.

Katie 13:12
Yeah, everything looks a little foggy, right? Yeah.

Maggie 13:14
And then fog gets into my eyes.

Katie 13:16
[Laughs.] How long have you had glasses?

Maggie 13:21
Since when I was a baby?

Katie 13:23
Yeah, that's right. Do you like wearing glasses?

Maggie 13:27
Yeah.

Katie 13:28
What do you like about it?

Maggie 13:29
Well, they're purple and blue. I really love the My Little Pony ones because they have cutie marks on them.
Katie 13:37
Oh, your glasses have My Little Pony cutie marks? That's pretty cool.

Maggie 13:40
Yeah, flower ones.

Katie 13:41
That's pretty cool. You said that when you take your glasses off, sometimes you bump into stuff. What are some of the things you do to help you get around?

Maggie 13:53
Well, sometimes I take a forward step so wide, then I tell how many long ways it goes.

Katie 14:02
So you count steps, right, before you take them?

Maggie 14:05
But if I want how many steps I just say the number out loud.

Katie 14:12
So at school in your classroom, because you have low vision and you see a little different, you have some special stuff to make school easier for you. Do you remember what some of those things are?

Maggie 14:24
Yeah. I have that slant board.

Katie 14:26
Yes. slant board. Yeah.

Maggie 14:29
Sometimes I put my Chromebook on it. Sometimes my workbook and some other stuff, like papers. I like to draw. At snack time I sometimes draw.

Katie 14:42
So you go to the eye doctor once a year, sometimes twice a year. And when they look at your eyes, they use all sorts of machines and stuff. And sometimes they have you read things out loud. Do you remember when they put those drops in your eyes?

Maggie 15:00
Yes, yeah.

Katie 15:01
What was that like?
Maggie 15:02
It was tickling.

Katie 15:04
It tickled your eyes.?

Maggie 15:06
A lot!

Katie 15:08
If you could tell people one thing about the way you see, what would you tell them?

Maggie 15:16
Well, I only wear glasses in the day. But I do not in the night. And that's even real. But if I see in the night with my glasses, I just bonk into stuff, just like I do with my glasses in the day. When I look at things without my glasses, I just say "What?!"

Jane 15:42
I think a lot of us can relate to that. Looking at things without our glasses or looking at things at night as we’re just trying to focus our vision and saying "What?! What is that?!" Thanks to Maggie and her mom, Katie, for sharing a little bit about what it's like to have low vision. I'm sure many of you listening also have low or no vision and have your own stories to tell. Let us know. We all see a little bit differently. But another way our eyes are all different is the way they look. We all have variations in our eye color.

Dylan 16:16
My name is Dylan. I live in Baden, Switzerland. I'm nine years old. And my question is, why do we have eye color?

Merritt 16:28
My name is Merritt. And I’m six and I live in Denver, Colorado. My question is, why are people’s eye colors different colors?

Bruno 16:42
Hi, I'm Bruno. I'm 10 years old. I live in Montreal, Canada. And my question is, why do we have different colored eyes?

Rhadid 16:50
Hello. My name is Rhadid. I am seven years old. And I live in Birmingham, Alabama. I want to know why we have different eye colors.

Molly 17:06
Hi, I'm Molly. And I'm six years old. I'm from Penticton, Canada. And I want to know, why are people's eyes color differently? Thanks. Bye.
Dr. Sujata Singh  17:20
That's a really great question. It just like hair color is kind of different, and it's just kind of how you had, it's all kind of determined by those kinds of genes. Other things can change the iris color. As you're growing older or like if you have surgery on your eyes or something, your iris can change color or shape even. And I would highly encourage you, if you're able to take a look at somebody's eyes underneath what's called the slit lamp, which I probably should have explained we usually look at the eyes under the slit lamp. It's like a microscope, but it's upright. And so if you look at an iris under the slit lamp, you'll see that it looks totally different than if you look at an iris just without it. Just face to face. And its colors are made up of all the pigment that is deposited on that iris structure, on that ring shaped structure that we call the iris. And so you can have, like, splotches of color. You can have mixtures of color and all that. So that's where all of that. So just pigment deposition. And just like in the rest of our skin, sometimes we have collections of color that's called freckles, so you can have freckles in your eyes, too. Yeah.

Jane  18:34
there are genetic components to your eye color, meaning the genes your biological parents give you play a role in what color your eyes turn out to be. But it's pretty complex. Eye color is part of the diversity of all the people in the world and how we all look a little bit different. And here's something neat: Sometimes babies are born with a certain eye color that changes into a different one over their first several months of life. My eye color is kind of, I guess, a light brown or yellow. My mom always called it caramel color when I was a kid. Dr. Singh took a look at my iris, the colored part in that thing she just called a slit lamp. And she says technically, my eyes are considered hazel. I didn't know that. And I have a freckle in one of my eyes. She took a picture of my eye that we'll share on our social media pages and in our newsletter. It was really cool to see how different my iris looked magnified. Kind of like the difference between a mountain you see from far away that looks smooth and all one color and a mountain you see right in front of you, full of the texture and colors of different trees, hills and valleys. We had one more thing to do in our eye exam.

Dr. Sujata Singh  19:50
This is what I call my dinosaur hunting hat. We use it--it's the last thing that I usually do for kids to look at their optic nerve and their retina. So that's the two structures that are in the back layer of your eye. And I want to make sure that those are healthy too. And so I put on this hat, which has a very--

Jane  20:08
Oh, you put it on? I don't get to put it on?

Dr. Sujata Singh  20:11
Sometimes. If you're able to follow directions, sometimes we can have you put it on, actually. And then it has a bright light. And then we take another lens over here. And this is how I get to see your optic nerve. So you look right at me and I can look all the way into the back of your eye. It's easier when lights are down, actually. And look right at your optic nerve. It's very bright, right?

Jane  20:37
Yeah. And it almost feels like I can see like blood vessels or something in my eye. Is that possible?

Dr. Sujata Singh 20:43
Yeah, it is. [Makes a weird noise.] That is usually how I got kids to look at it. We do a lot of noises, animal noises, like RIBBIT! Or RAWR! That's when I know I can see the dinosaur.

Jane 21:01
Now I can't see anything as you shined a bright light in my eye. And what are you seeing? What does it look like when you see my optic nerve?

Dr. Sujata Singh 21:09
So basically, I'm seeing the nerve head on. So it's like a cable. And if you aren't looking at the length of the cable, you turn it so that you can see the circle at the end of it. That's what the optic nerve looks like. And it has a natural depression or cup or spot where it goes down.

Jane 21:27
Kind of a dent?

Dr. Sujata Singh 21:28
A dent is a good word, yeah, in the center, and I want to make sure all of that looks healthy. Because the optic nerve is connected to your brain. If something's going on in your brain making you sick, we can sometimes see it in the optic nerve, some infections, some other stuff can happen. And so we want to make sure your optic nerves are nice and healthy. They're also, like malformation or things that kids are born with that we that we can diagnose and you would never know it. Because that's the only vision you've ever had unless we take a look. So that's the optic nerve, and then all the tissue, all the stuff around it is called the retina. And that's the stuff, like I said, that gives you your color vision, that gives you your ability to see really, really fine detail. The fancy word for the those cells are called photoreceptors. And that we want to make sure that all of that's healthy. So yeah.

Jane 22:17
One of the things that you can test for, too, is if I'm seeing all of the colors that many people can see, or if sometimes maybe I don't see all of the same colors. But then there's that kind of age-old question that so many of us have had in our lives of: how do I know that what I call red is the same thing that you call red?

Maggie 22:41
My name is Eleanor. I'm seven years old. And I live in Brooklyn, New York. And my question is, how do we know that we are seeing the same colors?

Dr. Sujata Singh 22:53
Well, that is a really great question. And a really great, great way to think about it. It's a really, that's the importance of realizing that we're all experiencing the world through our own filters in our own brain. And that's, you know, we're not always seeing the same color as the person next to us, because we all have different, different retinas. And we all have different cells in our eyes, and our brain is telling us...
what we’re seeing. And so we all have different brains. So but we do have a standardized way of testing. It’s called the color plates. We can test your color vision with that. And we have you kind of we usually test one at a time. And we have you go through and tell us what you’re seeing this is for little kids.

Jane 23:38
So you’re showing me pictures with lots of little dots. And to me, it looks like many of the dots are different shades of orange. But then inside this circle, some of the dots are different shades of green in the shape of a square. So if I couldn’t see the green, I might just see all of these dots as one big circle, right? And then you would know that I’m not seeing green?

Dr. Sujata Singh 24:00
Yes, exactly. So somebody who can’t tell the difference between green and red are going to say that they don’t really see that square shape in the center that’s made up of the green dots. And so that’s how we know that you’re seeing the world differently. But the shades of green that you see—we both have normal color vision—that you see compared to me might be different because we just have different ways of seeing the world.

Jane 24:22
And I might call it like green and you might say that’s not light green. That’s, you know, military green or spruce tree green.

Dr. Sujata Singh 24:31
Yeah, exactly. Yep.

Jane 24:33
Is there anything else that we should know about eye exams?

Dr. Sujata Singh 24:36
Um, I think the main thing is we all know that you’re anxious and you’re nervous and we all really appreciate you, like the kids, being so brave because we do ask them to do a lot and sometimes even more than what we ask the adults to do. And they are just usually so game and they really try their hardest. So it is a different exam and there’s different reasons why we’re seeing the kids because you want you to learn to see as good as you can. And so that takes time. And that takes a lot of a lot of, like, trying new things.

Jane 25:08
Dr. Singh, thank you very much for teaching us about eyes and eye exams. This is so interesting.

Dr. Sujata Singh 25:13
Thank you so much for being interested. It was great conversation. Thank you.

Jane 25:18
That was Dr. Sujata Singh, a pediatric eye doctor at the University of Vermont Medical Center, and the Larner College of Medicine. Now, if you have a question about anything, have your adult send us a voice recording of you asking it. You can do it on a smartphone using a voice recorder or voice memo app. Be sure to include your first name, where you live and how old you are with your question. Then your adult can email the file to questions@butwhykids.org. Or you can submit a question directly at our website, butwhykids.org. But Why is produced at Vermont Public and distributed by PRX. Our team includes Melody Bodette, Kianna Haskin and me, Jane Lindholm. Our theme music is by Luke Reynolds. We'll be back in two weeks with an all new episode. Until then, stay curious!