



Nearsightedness and Chickens with Dr. Brittany Carr **Nerdin' About Podcast Transcript, Season 1 Episode 2**

Michael

Hey everyone welcome to Nerdin' About, I'm space Michael and with me as always is my Nerd Nite Vancouver co-host who we learned from a previous episode was self-isolating by going into the ocean. Kaylee, how is your ocean isolation doing?

Kaylee

My ocean isolation is going very well, thank you so much for asking. I've been going a couple times and yeah there's never anybody else in the ocean which is weird. Have you been isolating in the ocean?

Michael

No, I've just been going for my death metal runs which there are way too many people running on pathways right now. It's creating havoc, because people are walking beside each other on the sidewalks, and then I jump into the bike lane, and then the bikes are beeping at me, and then the bikes are going into where the cars are going. It's wild out there, so everyone be safe.

Kaylee

Oh, that sounds very metal.

Michael

Yes.

Kaylee

Well, we're here for our second episode and we are so overjoyed to introduce to you Dr. Brittany Carr. Brittany Carr is a postdoctoral fellow and vision research scientist at the University of British Columbia, where she currently studies inherited eye diseases. She's also an artist and avid wildlife photographer. Welcome to our Nerdin' About Dr. Carr.

Brittany

Hello, thank you so much for having me. I also want to say thanks for the shout out on Twitter and Instagram. I kind of feel like I have to point out that I had actually a really good giggle about your use of a picture of Bubbles from Trailer Park Boys for the episode. This is because I'm actually here to talk about nearsightedness, and he wears glasses that are for somebody with farsightedness. So I thought that was pretty funny. You can tell because lenses for somebody who's farsighted will cause their eyes to get that really comedic kind of coke bottle look to them, versus lenses for somebody who are near sighted will make their eyes actually appear smaller. So it's a perfect bridge for what we're going to talk about today.

Kaylee

It is a perfect bridge. So yeah, why don't you start off and tell us a little bit about what it is you're working on or the research that you've been doing?



Brittany

Yeah so I think we're going to talk about refractive error today. All it is, is it's basically just blurry vision. It's for vision caused by the inability of the eye to focus light accurately onto the cells in the eye that capture light. Basically refractive errors, they're primarily due to the shape of the eye. So what happens is either your eye grows too big or too small, and then this is what's causing the problems with our blurry vision.

Kaylee

And that blurry vision is either nearsightedness and farsightedness, or is that both of them?

Brittany

Yeah, nearsightedness and farsightedness will both cause blurry vision. The only differences between them are farsightedness, your eyes are too small, nearsightedness, your eyes are too big. And then you need different shapes of lenses to correct for those problems.

Kaylee

Oh, interesting. So you did some work for your doctoral work on nearsightedness? Would you mind telling us a little bit about what that involved?

Brittany

Yeah, so I studied nearsightedness and the clinical or the scientific term for nearsightedness is actually called myopia. What this means is you're not able to see far away objects clearly. So there's a clinical definition for it, and that's a refractive error of greater than -0.5 diopters.

Kaylee

Okay, what happens when you're like, twice myopic?

Brittany

Yeah, so there's a second designation, and this is called high myopia, and that's defined as greater than -5.0 diopters.

Kaylee

Oh, yeah, that's me.

Brittany

Yep, that's me, too. So I have a refractive error of -7.5 diopters.

Michael

Is this part of the reason why maybe you got into this work? Because when you were younger and getting corrective lenses with such a high rate like that, vision probably really affected you when you were young.

Brittany

Yeah, I've actually been asked that question quite a bit and my answer is: maybe not sure. I did spend a lot of time in the optometry office, and actually in the beginning, I wanted to be an optometrist.



Kaylee

Oh, really?

Brittany

Yes. So I worked as an optometric assistant for a few years before going to school and discovering research. Then I just kind of decided that you know what, I really love research, and so optometry got pushed aside and now I'm a scientist, and I'm really happy I made that choice.

Kaylee

So in regards to myopia, this nearsightedness, what in particular have you been working on, and why is it important that we understand this a little bit better?

Brittany

So the reason I started to study nearsightedness is because it's actually the leading cause of visual impairment worldwide, and its prevalence is actually increasing at an alarming rate. So the global prevalence of myopia is close to 30%, and about 4% of people have high myopia, but this is actually expected to double in the next 30 years to be almost close to 50% of the population with myopia, and then 10% of the population with high myopia. Even more interestingly, and more worryingly, is that in developed countries, and especially countries in East Asia such as Singapore and Taiwan, they have extremely high prevalence of myopia. So we're talking about 80 to 90% of the population under the age of 19, and about 20% of the population with high myopia.

Kaylee

Why is that? Why might these places be seeing an increase in myopia?

Brittany

So we think it's definitely both genetic and an environmental cultural thing. Because myopia is growing so rapidly, and because it's just really changing at a very fast rate, we think it's an environmental issue because these populations have a very high emphasis on academic work. They're very bookish, they spend a lot of time learning. We think that it's this high amount of near work, and high amounts of time spent indoors that could actually be causing this very significant prevalence of myopia compared to other more rural cultures. This is also seen in urban centers that have higher correlation with myopia and same with academic jobs, and even other careers that keep you inside. They did a really interesting study a long time ago on military submariners, and people who spent significant times in a submarine under the ocean also developed higher proportions of myopia.

Michael

So what you're saying Brit is that the more people are nerdy by staying indoors reading books, the more their eyesight is gets worse, and then the more that they will need eyeglasses. So it's kind of like this nerd evolution happening across the world.

Brittany

Yeah, almost a self-fulfilling prophecy with the nerdiness, and the glasses that come right along with it.



Kaylee

So other than wearing very stylish nerdy glasses, is there anything we can do about myopia?

Brittany

Yes. So a lot of people might think, okay, what's the big deal with myopia? Because if you're myopic, you go to the optometrist, they give you your prescription, you get your glasses, and then you can see fine again. So why is this a problem? Actually, it's a problem for two reasons. The first problem is that you start to become myopic at a young age, and the younger you become myopic, the more likely you are to progress to high myopia by the time you're an adult.

Kaylee

Can confirm.

Brittany

Yeah, I was going to say I have glasses. I definitely didn't start in a -7.5, and for you as well, you have high myopia, and you definitely didn't start at that high myopia, either.

Kaylee

-9.0 everyone.

Michael

Whoa. I'm only -5.0.

Kaylee

Oh, but you're in high myopia. Welcome.

Brittany

Yeah, we're all high myopes. So anyone who starts off early with myopia progresses to high myopia. The second reason is that myopia, and especially high myopia, predispose you to other blindness causing problems later in life. So this is things like retinal detachment, cataracts, and glaucoma.

Kaylee

I never actually thought about that, but I do see a retinologist . I've seen one, honestly, for as long as I can remember, and I even once had a situation where I went in to see the retinologist, and we had an emergency laser your retina down, tack it down and strengthen it. So yeah, I had never really considered that maybe the retinal issues would be associated with the nearsightedness that I have.

Brittany

Yeah, and this is just because the eye has grown so abnormally large that it's actually stretching the retina. And just for anybody who doesn't know what the retina is, it's the tissues that lines the back of the eye and it contains the cells that are responsible for capturing light, and then turning those light signals into something that can be understood by the brain. So basically what's happening is your eye is growing, and you have this tissue at the back of your eye that is being



stretched and stretched, and what happens is that it makes it more prone to ripping or tearing. And if you didn't have a retina, or if your retina detached from your eye and was left there without intervention, it would die and this is can actually cause blindness.

Michael

So you say Brit that the work that you do is in inherited diseases. Now, this myopia is it inherited? Like my mom had, she had vision problems, she wore contacts her whole life. My dad didn't, but he eventually did get cataract problems later in life. So is there information that people can use that can help them later in life knowing that these are inherited diseases?

Brittany

Yes. So myopia is also strongly correlated with it being inherited. So if you have one parent with myopia, or versus two parents with myopia you're more prone to myopia if you have too myopic parents. For me, interestingly, my mom is not myopic, my dad is, and I have high myopia. My younger brother has high myopia, but my older brother has perfect vision. So it's not always 100% inherited trait. Again, a lot of it, I think, comes back to environmental problems as well. And unfortunately, if you have myopia, there's not a lot that we know that we can do to prevent or inhibit the progression of myopia. So one of the superstar kind of ideas coming out in the last probably 10 or so years are actually exposure to outdoors light can help inhibit myopia. But in terms of lenses or drug treatments, there's no widely accepted treatment, which that actually was the crux of what I was studying was trying to develop a pharmaceutical treatment to inhibit the progression of myopia.

Kaylee

So can you tell us a little bit about that pharmaceutical treatment? What is it and how does it work?

Brittany

So it's a drug called atropine, and it blocks receptors in the eye called muscarinic receptors. And usually when you're using atropine in an optometric setting, you're using it to dilate the pupils. So it's very common, it's already in eye clinics, and they use it to dilate your pupils so they can look into your eye and get a better visual picture of what's going on in the back of your eye. However, people have also found that used once daily or twice daily, low dose atropine can inhibit the progression of myopia. However, it doesn't work great, and it needs to be used in children and we don't actually know how it works. So we're kind of using this drug off-label, it's not approved for this use. We don't know how it works, and we're using it in kids.

Kaylee

Oh, that doesn't sound super great.

Brittany

Yeah. So what I was trying to do was to figure out how does atropine work? If we can figure out how atropine works, can we make a drug that's better, that doesn't have side effects. So because atropine blocks these muscarinic receptors in the eye, it dilates the pupils. These children have photophobia, which means that they're very sensitive to light, and it also paralyzes



accommodation. Accommodation is the ability of the eye to adjust to near work. So these kids' eyes can't adjust, they're just like your older parents who have to wear bifocals, they can't focus on things close up. If you've ever had your pupils dilate or atrophy, you've experienced this, it's very uncomfortable.

Kaylee

So do the drugs prevent your ability to do near work? Is that how it could potentially help? Like the less near work that you're doing, the less strain you're putting on your eyes?

Brittany

Yeah, that was a hypothesis for a long time. Myopia, as I've already discussed is still definitely strongly correlated with near work. However a really cool thing about atropine is that it also inhibits myopia in chickens, which is what I studied. And in chickens accommodation is controlled by a different type of receptor. So chickens can still do near work, and atropine still works to inhibit myopia in chickens. So not a 100% answer at this time.

Kaylee

Can you tell us how the "cluck" you studied near work in chickens?

Brittany

How I would study myopia in chickens is we would attach these little plastic diffuser goggles, they're superduper high tech. What we would do is we would take blister packs from pill packages, scuff them up with sandpaper and attach them over the eyes with velcro. So basically what these chickens are looking through is a frosted window. It's really cool and it causes the eye to grow uncontrollably.

Kaylee

So do you have to put them on the chickens when they're really little?

Brittany

Yes, we start when the chickens are one week old.

Kaylee

Okay, so you have them when they're really little, you put their little glasses on, and then what happens?

Brittany

So we either just leave them for a week and that will cause the eye to grow, and actually this works super well. So then I would apply different drug treatments to the goggled eyes to see if we could prevent that eye growth from happening.

Michael

Have you ever seen Ren and Stimpy?

Brittany

When I was a little kid I did!



Michael

Well Ren would sometimes get excited or sad, his eyes would enlarge and they'd like start to come out of his head and it was just freakishly cartoonish. It was the first thing that came to my mind when I was thinking with these chickens and their eyes getting bigger.

Kaylee

Oh, maybe he could have used atropine. I just remember that that show used to always make me nauseous, because there'd always be these like really gross parts of it but I always remember the episode about the great Canadian Mounted Police, or whatever, they sang that our country reeks of trees, our yaks are very large, and they smell like rotting beef carcasses. So okay, so you put the little goggles on, were there any challenges working with chickens to do this kind of work?

Brittany

Yeah. So our lab wasn't very high tech. So if you have a high tech lab with lots of money, you can get what's called an autorefractor. All you do is you set up the chicken in front of this machine. It's very similar to the machines that are in the optometry office. If you've ever sat down in these, they have you look at a picture of a hot air balloon, or a little house.

Kaylee

Literally 1 million times, I did it last week.

Brittany

That's an autorefractor for people. So you can do the same thing for chickens, and it'll actually give you the refractive error. I wasn't that lucky. So in our lab, we had to use a technique called streak retinoscopy. We have a little handheld lamp that projects just a slit or a streak of light, and then we would grab our chickens, and we'd hold them at arm's length behind what are called trial lenses. You project that streak of light across their eye, then you watch for the reflection of that light to come back out for the eye, and you watch the movement of that light. So I'd be sitting in a dark room, holding a chicken at arm's length, watching the movement of streaks of light. This is even better when you remember that I was working with birds, and as soon as you turn off the light with birds, they fall asleep. I was in a dark room trying to keep these sleepy chickens awake while I read the refractive error through trial lenses. So if you're really, really good at this, you can probably nail it down in about three to five minutes, but when you're learning this technique, it can take a long time.

Kaylee

This is the real science. You know what I mean? It's the stuff that you don't think about, you have the nice paper that comes out with the findings, but what people don't see is the hours that you spent trying to keep chickens awake!

Brittany

Yeah, yeah, no, for sure. So basically, in a very roundabout way, what I found is that atropine may not be binding to the receptors that we think it is.



Kaylee

Oh, so should we be using atropine?

Brittany

So here's the thing. It works, not great, but it's actually one of the best things that we have right now to inhibit myopia. So there is always this kind of push and pull between: it works, but do we really need to know why it works? I would say we do need to know why it works because there still are problems with it. If we understand how it works, then we can do better and we can develop better treatments.

Michael

Awesome. Let's move on to some audience questions, and we had a couple people ask a similar question. Richard from Twitter and Janica from Facebook, essentially asking about eye exercises and if staring at the horizon could help improve nearsightedness, and if there's some eye exercises that could perhaps lessen some of the vision decline that happens as we age.

Brittany

Yeah, so the short answer to that is: probably not. Unfortunately, these eye exercises, they were kind of pushed into popular culture quite a while ago by one specific ophthalmologist, and kind of got popularized and made its way into old wives tales a little bit, more of the alternative kind of medicine movement. There's no evidence to show that these exercises work beyond say a placebo effect. This is because, as I said earlier, these refractive errors are due to changes in the size of your eye. So if you think, "will staring at the horizon cause my eye to shrink?" The answer to that is no. These eye exercises, what they can do possibly is change accommodation. So our eyes have two different focusing components, we have our cornea, which is static, and the cornea always stays the same. Then we have our lens inside of the eye, and the lens can squish and stretch according to close we are to the focal points of the things that we're trying to see. So some of these exercises might be able to affect the squishing or the stretching of the lens, which could change the way that you're seeing. However, these eye exercises won't prevent or cure nearsightedness or myopia.

Michael

So it may not actually help our eyes, but I can tell you that it does really help with your existential brooding. Just to get out there and stare at that horizon, for as long as it takes really. Let's move on to another question from Mary, also from Facebook. Why do some people have better color vision than others? So the color acuity and sensitivity. How can some people differentiate colors better than others?

Brittany

Yeah, so this is due to certain molecules in our eye called opsins, and these opsins are what are responsible for picking up light. Depending on the type of opsin you have in the eye, they have different spectral sensitivities, which means that each opsin is sensitive to a specific wavelength of light. So what happens is, in humans, we have three different types of opsins. We have a blue opsin, a green opsin, and a red opsin. Normally, we have these opsins in our eyes and they're sensitive to the lights, and the mixture of the way the light is hitting the eye, and the mixture of the activation of these opsins, are what gives our eyes our color sensitivity. This is why some of



the population can have colorblindness. This is because people who are colorblind are missing or have a defective type of opsin. So for example, if you have a defective red opsin, you won't be able to see red light. If you have a defective green opsin, you won't be able to see green light. So it's the opsins that control our sensitivity to color.

Michael

Alright, so we're gonna move on to our segment "Whatcha Nerdin' About?" Brit, what have you been nerding out about recently?

Brittany

Well, recently, it's a little bit harder to nerd about wildlife photography because parks are closed and it's a little bit tougher to get outside with the physical isolation guidelines in place, but that's something that I've always really loved to do. I'm a big bird watching nerd so I love to take photos of birds and actually I have a personal vendetta to take some pictures of this Kingfisher that hangs out around Capilano hatchery.

Kaylee

So you've been looking specifically for this one elusive Kingfisher, or is it are there just Kingfishers in the area?

Brittany

Just Kingfishers in the area, I think but they only show up when I don't have my camera with me. I love the area, and I love to hike out there, but every time I go out there and I bring my camera, there's no kingfishers. I leave my camera at home, the kingfishers show up. Now it's starting to feel a little bit personal.

Kaylee

Very cool. Love me a Kingfisher. Michael, what have you been nerding about?

Michael

Well normally I don't have a nerd out that relates to the topic, but I actually just got a brand new pair of glasses. I actually have quite a long history with glasses, and in my downtime I've been thinking about some projects I want to work on and I've been thinking a lot of my childhood and I've been thinking about writing about my relationship with glasses, because it really had a big effect on my life. When I first got glasses, people looked at me differently all of a sudden I went from like a very confident boy to being very introverted. I just took a hard cut into introversion when I got the glasses, but I also played sports and they broke a lot and we didn't have that much money. So my dad literally would solder them together with wire, I looked hideous going to school with these glasses that had soldered on wire to them. So I've been nerding out about my new glasses, I like them and I think I'm going to go back to being a glasses person for the most part. It's been fun to kind of go back into that world, and I feel it it does change my personality. When I have the glasses on, I say to myself: "I'm a glasses person". I feel like I've put that person to bed for a while not having glasses. So happy to see what changes will happen.



Kaylee

Just wait till you let that Michael out.

Michael

What about you Kaylee? What have you been nerding out about?

Kaylee

So I've also been nerding about glasses, but of a different sort. So yesterday was my dad's 77th birthday. Happy birthday Lobester, which is his nickname. Anyway, I was talking to my family on Zoom and I was talking about some of your work Brit around chickens and eyesight. My mom out of nowhere is like, well, you know, back when I was on the farm as kids we actually used to put little glasses on the chickens. I was like, Whoa, whoa, whoa, back it up. Tell me a little bit more about this. So apparently they had a real issue on the farm with the chickens pecking each other, because once one of them is bleeding and they see red, they all gang up on that chicken and peck it to death. So back in the 1950s and 60s, they had these tiny little glasses that you would put on the chickens that were rose colored, so that everything was pink, and it would neutralize the red to keep them from pecking each other to death. Now they had like 300 chickens, so they put 300 of these tiny glasses on these chickens. I went to look up a little bit about this and I found a video from Paramount News. It's in black and white I think there's like a picture of the patent there. It was talking about how these glasses saved 5 out of every 200 chickens lives, and how when they ate the glasses would flip up, or they could see underneath them, but otherwise they had a "rosier outlook on the world". Anyway, this was amazing. I lost my mind. My mother contacted my grandmother who's like 93 years old still out on the farm. Apparently they still have some, so you better believe I'm about to have some in my apartment. I'm so excited. So chicken glasses. I've been nerding out about chicken glasses.

Michael

Awesome. Well, thank you so much, Brit, for joining us on Nerdin' About. If people want to find you on social media, where should they go?

Brittany

They can find me on Instagram, where I like to post pictures of my wildlife photography, and that's @b.m4573r. I'm also at Twitter under the same username, where I like to post all of my scientific updates. I think that we also talked about maybe later in the fall me giving another talk on my work with frogs, and that should be also accompanied with a lot of beautiful photos and really cool visuals. So if that happens, I yeah, I would love to see people come out and see awesome frog photos.

Michael

Yeah, we can't wait to start doing live shows again. But in the meantime, Nerdin' About is what we've got, and we're really excited about some of the new upcoming episodes. Thank you everyone that's been following us. If you have any suggestions for guests that you'd like to see on this podcast, contact us @NerdNiteYVR, Twitter, Instagram, Facebook. That's it for us, we'll see you next time.

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