Eye on Double Vision: Convergence and Divergence Insufficiency Transcript

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Introduction to Double Vision and Strabismus

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Those prism glasses for small angle deviations, or when somebody fatigues at the end of their day, can be quite useful for cases of convergence insufficiency.

many people, the aging reading glasses anyway, so you incorporate the prism into the reading glass, and that helps them avoid an operation. For cases that are larger angles, your deviations, is medically noticeable deviators, where prisms glass can be unwieldy because of their thickness as they get to a higher level, or exercises have been exhausted or just haven't been successful, surgery for convergence deficiency is quite successful.

and it can be a permanent solution by tightening one or both of the inside muscles and enhancing your ability to convert. Welcome to the IQ Podcast. I'm Dr.

Ronni Banek, here to help you boost your IQ with powerful insights that connect your eyes, your brain, and your whole body wellness. This episode was recorded during the iHealth Summit, where the world's leading experts shared breakthrough insights in vision and holistic eye care.

Hello, everyone, and welcome back to another session on the iHealth Summit. I'm your host, Dr. Rani Banik. And today, I have the honor of a very special person joining me today for this interview, who is Dr Brian Campolotero.

Dr Campolitero is an assistant professor of ophthalmology, specializing in pediatric ophthomology and adult strabismus at the New York Eye and Ear Infirmary of Mount Sinai.

So it's such a pleasure to have you with us, Dr. Kambalatero, thank you. Thank you so much for inviting me, Johnny. Absolutely. So Dr Kamberlatera and I actually go back a long ways.

I think we've known each other for maybe, I don't know, 15 years now, and have sent many patients to him. and we're honored to be his friend and colleague.

So Dr. Campolatero, can you first share with the audience, what was it about pediatrics and pediatric eye disease and strabismus that really drew you to this field?

I enjoyed the neuro, the neurology aspect of strabbismus involving cranial nerves and nerve disorders, brain related diseases that caused straubismus in some cases.

And that was what initially drew me to the subspecialty. Got it. OK. So you were interested in the neurologic aspects of it, but then there is the surgical aspects as well.

For our audience also, could you first define some terms? In ophthalmology, we use this term a lot called diplopia. What is diplopoeia? Diplopia is a synonym of double vision.

Double vision can come in two forms. It can from one eye alone, if there's disease within the eye, splitting the light as it reaches the retina. or binocular or double vision from both eyes together where there's misalignment between the two, so they're no longer parallel working in identical fashion.

Got it, got it. And you also mentioned earlier strabismus. So what is the definition of strabbismus? Strabbismus is a word for eye mis-alignment. They use the term squint in the British system of ophthalmology.

Strabismis is German derived word. That means eye-misaligned. Got it, got it. Okay. So now let's go back a little bit more to the concept of having double vision.

When people have this issue, what may they experience? What types of double-vision can occur symptomatically from a patient point of view? So when someone presents with double visual, you first have to define whether it's monocular from one eye or both.

You just ask the person to cover one-eye and you'll be able to tell if this is a double vision that persists when one eye is covered. If that's the case, then you have to look for surface reasons, corneal reasons lens reasons or vitreous or retinal reasons.

There's something about the eye itself as the light is focused from outside onto the retina surface that splitting or diverging that light fiber that is causing double-vision.

You mentioned a quick and simple test is just to cover one eye. And so if a patient doesn't know whether they have monocular double vision or binoculars double-vision, they can just cover on eye and see if it's persistent.

Is that the best way to do it? And if its monocolous, you'll know which eye is at fault. They'll see single with one and double with the other. Sometimes people can see double, with each eye independently.

Defining Diplopia and Eye Misalignment

So it is possible that can happen as well. Right, uncommon, but definitely possible. Yeah. Okay. So for those issues, it's typically from your explanation, you said it was probably something optical going on in the eye, whether it is the cornea, maybe it s from dry eye or maybe the lens.

Maybe the patient has a cataract or something in the back of the eye, either the retina or the vitreous. So that can be managed by a regular eye doctor, like an ophthalmologist or optometrist.

Is that fair to say, some of those issues? Yes, of course. Yes. Most definitely. OK. And then now let's talk about binocular diplopia, which I know is your real forte here.

Can you explain a little bit more about what a patient may experience if they have bin ocular Diplopia? So double vision can be vertical, horizontal, or rotational, torsional.

And most patients can define and describe or even draw the double-vision in great detail. It can uneven, meaning looking left or right changes those images.

Or it can the same throughout. We use the terms cometent for when it's equal in all gazes and incometent when its uneven. Children see double vision less often.

The child brain allows for suppression or ignoring one eye if it's going to cause double-vision, especially earlier in childhood. So children undergo less diplopia and more vision loss from disuse than we see in older children or adults.

The one exception to that rule is children who have an eye movement disorder that allows them to have single vision in some gazes and double vision and others.

One classic example is a fourth nerve palsy, one of the muscles to the eye, the superior oblique, doesn't get proper innervation. And the child often realizes that with a tilt of their head, Their double vision goes away.

So they'll walk in with what we call ocular torticalis, which is the Latin word for twisted neck. Those are children who can find a head posture to erase their double-vision and put their eyes in a position that they're parallel.

That prevents amblyopia in those children, so it's a very useful maneuver. Adults will often find ahead posture as

well that will minimize their And that can be a chin down, chin up, turn or head or a tilt of the head.

So often when I enter the room and I meet the patient for the first time, as I'm introducing myself, I'll make note of their head posture because in this particular situation, it could be integral to making the diagnosis.

Absolutely. Thank you for those insights, Dr. Campolatero. I want to go back to what you mentioned about children. If their eyes are not aligned, they may actually suppress one eye.

And then you mention amblyopia. So is that equivalent when an eye is being suppressed by the brain and ambliopia? Are those two equivalent terms? So a child will typically undergo suppression in the connective nerve from the eye to the brain.

The image is effectively cut off. Repeated suppression over time, especially in younger children, causes rapid vision loss from disuse or amblyopia. And that's treated by patching the dominant eye.

so that the weaker eye must be used. Realigning the eyes also aids in amblyopia therapy. And there are some misconceptions. The patch doesn't fix the eye misalignment in those cases.

It switches it, which is very useful for stimulating vision development. For the system to work optimally, you need great vision in both eyes as well as great alignment.

So one problem begets the other. A combination of treatment of ambliopia and strabismus leads to optimal outcomes. There are some children who, at a very young age, may start to have some misalignment where their eyes are significantly crossed in.

Now, in that scenario, would you recommend patching, or perhaps a different therapy, perhaps even surgery for very children, let's say infants or toddlers in, that age group?

So it is common to variable eye movements in the first six months of life in a child who's born full term. Premature children have a higher risk of strabismus and amblyopia.

Children, Suppression, and Amblyopia

But in a full-term child, for the first six months of life, you can take some of the eye movements with a grain of salt, especially if they're small or variable in their degree of eye misalignment.

Once a child hits six-months-of-age, it's like a line in the sand. The visual cortex, the part of brain that handles vision and 3D vision, is rapidly developing in normal child and will degrade quite quickly in child after six month of age.

So when infants who have a large inward eye turn, which is a classic infantile esotropia, inward-eye turn position, we know that earlier surgery optimizes not just the visual acuity between the two eyes, but their ability to work together.

Their depth perception, their binocular vision, they're stereopsis, those are all synonyms, is really related in some form to how long they remain misaligned until their eyes are straightened.

Plenty of studies show that surgery by age one has a much better outcome in the brain, allowing for division than after that age. So for large angle deviations, for constant deviation, we really try to intervene quite early.

And the reason you want binocular function in a child who has none is that's the glue that sort of holds our eyes together. So you and I wake up with straight eyes most days because we have a mechanism to realign them.

That's depth perception. And without that mechanism, long-term eye alignment can often suffer. Okay, understand. I understand that. Now, I've actually had some patients, parents who brought in their young ones, and their eyes

are very crossed in.

And they're a little hesitant to have their child undergo surgery. They hope that with time, their children will just outgrow this eye turn. Does that ever happen, especially with this type of isotropia at a young age?

In small angles and small versions of that disorder, I've seen that happen. But in large versions, it almost never happens. So it's very important to optimize vision in each eye by patching if necessary, while a parent is deciding the fate of the child.

And I do often ask them to go for other opinions so that they can hear from multiple respected sources what is usually the very similar recommendation.

Yeah. What I'm hearing from you is that It's better not to wait. It is better to act on things as soon as possible to really to help the brain development so the child will have binocular function.

Now, let's move on to adults. Now I know it can be very disconcerting when someone wakes up all of a sudden and they have double vision, or maybe they've slowly had some double and it becomes more and more constant over time, over months to years.

When you first see a patient, an adult who comes in with double-vision, what are some of the first things you do on your history taking and your exam?

What do you want to know from the patient about their double vison? Certainly if there was any head trauma in the related time before that or neurovascular event like a stroke or high blood pressure event that can cause temporary lack of blood flow.

to the vascular supply to muscle and cause a temporary double vision phenomenon. A general medical history is taken along with recent eye surgery history to know if there was any surgery that may have inadvertently caused damage to a muscle or that local anesthesia that can be used to do various eye procedures in some cases can cause a contraction or paralysis of one of the muscles leading to double vision.

So it's important to understand the background ophthalmic history because successful surgeries in opthalmology can still have untoward side effects of double-vision if local anaesthesia causes change in the muscle's ability to function.

So you ask about head trauma, you asked about recent strokes or perhaps stroke risk factors, and you asking about recently eye surgery like cataract surgery, for example, if someone gets an anesthetic injection behind the eye that could potentially cause double vision.

Is that true to say? Correct. And certain forms of plastic surgery, oculoplastic surgery when enough local is used, retina surgery. Glaucoma surgery forms, of ophthalmic surgery are done really under very local conditions.

It's an uncommon rare phenomenon to get double vision from this kind of local anesthetic, but it's been reported. Yeah, and I've definitely seen patients where they may have had some double vision after a procedure and then gradually it does improve.

So it's best, at least in the patients that I have seen with double-vision in this scenario, just to wait it out for a period of time to see if it gets better.

Adult Double Vision Causes and Evaluation

Let's now talk about this one type of double vison that people can get, or misalignment of the eyes I should say, that can people get called convergence insufficiency.

Can you explain exactly what that is and what types of symptoms patients may experience if they have

convergence insufficiency? Certainly. So convergence is a mechanism where our eyes slightly move inward to allow us to look at a reading on a page of a book or your computer or phone.

There's a mechanisms to bring our eye slightly inward, to focus on the target that's close to us. insufficient convergence causes the eyes to not adequately or easily bring themselves into dynamic focus, and one eye will have a lag or a drift.

And for someone who has normal vision up until that point, they'll see double. It'll be a horizontal double vision where set near. They can control this with effort, but they'll describe intermittent double vision more later in the day after fatigue, after having a drink, anything that sort of takes you out of your normal functional status.

And it's basically a frontal headache sort here in front. We're very reproducible on examination and the history is quite important in terms of where they see double, what time of day they double how frequently they say double and convergence insufficiency is one of those diagnoses that is rarely neurologic and can be treated especially in mild cases.

Now when the eyes converge is that something that people may experience more the symptom more at a certain distance like whether it's up close or far away when do people most likely experience this difficulty with double vision when they're not converging properly?

Yeah we use that term really to define a near double vision phenomena. So reading a book, looking at an iPad, something within arm's length. It tends to increase with age because we naturally get a little less function in most muscles as we age.

I can feel that already. And it is amenable to exercise therapy. You can teach someone to strengthen their convergence through exercises. We need to pull our eyes, and you can see me do that here.

So you could teach somebody how to strengthen the inward movements of both eyes through vision exercises. And it's quite effective in small angle strabismus.

Could you explain how this exercise is done, or just one example of this type of exercise for convergence insufficiency? One example is a jump convergence exercise.

So you look at the target in the distance, something maybe 10 feet away, and then you quickly look something that's rather close. You've jumped from a distance to a near target and you really focus on keeping that one image clear and single.

And you do that repeatedly back and forth. How close should you hold your target if you're using your finger or pen? Like how should it be, let's say 12 inches away or even closer when you doing that convergence jump?

Yeah, 12 to 18 inches at first. And then like any other exercise, as you get more facile with it, you can bring that target slightly closer, inching your way closer and closer to your nose.

Similarly, a second exercise is called a pencil pushup. So you take a target at about arm's length. And you slowly bring that towards you as close as you can, rather slowly, maintaining that image so it doesn't go double on you.

Now, it's normal if I'm looking at something close to me to see double something in the distance. That's called physiologic double vision. So I'm looking at my finger, but my computer is double.

And vice versa, if I look at laptop, my fingers double, that's normal, not a disease. That's not something to be alarmed about. It actually happens to all of us.

If our eyes are working properly, we should experience that. Yeah. I've had parents really be very concerned because their child all of a sudden developed double vision.

And it turns out that it was this physiologic diplopia, which is pretty reassuring that their eyes are working properly. Dr. Campolatier, you have been a wealth of information.

You shared so many insights thus far on double-vision in both children and adults. We're going to take a very short break here from one of our sponsors, and we'll be right back with more on Double Vision on the Eye Health Summit.

So stay tuned. You might have heard that eating carrots is good for your eyes, but what if we told you that there are more foods that can do wonders for our vision?

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Welcome back everyone to the iHealth Summit.

Convergence Insufficiency and Eye Exercises

Today we're chatting with Dr. Brian Campilatero, a pediatric ophthalmologist and adult strabismus expert. And so we were just talking about convergence and sufficiency in various exercises people can try to help improve their double vision.

At what point would you say that exercises are no longer going to be useful? Meaning that at what when may patients want to consider the next step of therapy, which is really surgical intervention for this problem?

I want to describe something called prism glasses as well. If somebody has a small misalignment, we can use a special form of eyeglasses that bends the light to where their eye is pointing.

So the brain thinks they had surgery, but all they did was change the orientation of the Those prism glasses, for small angle deviations, or when somebody fatigues at the end of the day, can be quite useful for cases of convergence insufficiency.

Many people, as they age, need reading glasses anyway, so you incorporate the prisms into the reading glass, and that helps them avoid an operation. For cases that are larger angles, larger deviators, cosmetically noticeable deviates, where prysm glasses can unwieldy because of their thickness as the get to a higher level, or exercises have been exhausted or just haven't been successful.

Surgery for convergence of deficiencies is quite successful and can be a permanent solution by tightening one or both of the inside muscles, enhancing your ability to converge.

Understood. Could you give an approximate range where you mentioned if the deviation is larger, then prisms may not be effective. So you may have to do surgery.

Is there for you and your practice, do you have a cutoff or is it really an independent, like personalized approach that you follow? We measure this in something called prism diopters, which is basically degrees times two.

If your eyes are off five degrees, I would call that 10 prysm diopters. And more than having a cut-off in prison diopter, the patient usually can explain when they're ready for an operation.

Their prison glasses are unwieldy. The exercises have been modestly effective. They may be working long hours on the computer and need optimal convergence for their job.

So most people reach a point where their non-surgical treatment is just unsatisfactory for the level of need. And then we together make that decision.

For convergence, especially, I think that's really the only way to go to the operation when you've exhausted the other possibilities. Got it. Now, let's move on, Dr.

Campolatero, to talking about the, well, I guess you could say it's the opposite of convergence insufficiency, which is divergence insufficiency. I know it is a hot topic right now and many people are getting diagnosed, they're undergoing treatment.

Could you explain what it, what the symptoms are and who tends to get this issue, divergence in sufficiency? So the term divergence and sufficency refers to somebody whose eyes become crossed.

at distance as opposed to near, especially when they look left or right. So crossing the street, for example, would give one outsized double vision for when you're reading a book.

Going to a theater or an event, a play, where there's a figure at a distance, religious service, and it tends to progress over time. And it's fascinating diagnosis because we rarely saw this prior to the phone usage.

And once people started spending a lot of time looking at things up close, they developed superconvergence, just the opposite of what we spoke about before.

So what they're doing by spending all day on the iPhone or their laptop or they work computer or reading is causing the inside muscles of your eye to contract and tighten.

So picture a person doing bicep exercises at the gym day after day, but they never do their triceps. At some point, their arm becomes bent because the triceps is so weak and the biceps become so strong that their basic tone is uneven.

And the chronic contracted state of the BiceP is noted. That's exactly what happens in divergence insufficiency. It's fascinating because as you get older, The outside muscle of your eye, the tricep in my analogy, naturally gets weaker.

It loses its anatomical position in the orbit. it's called sagging eye syndrome. So at the same time, you have a tightening of you're inside muscle. You have natural weakness and contraction of the out pulling muscle, leading to a distance double vision, side by side, worse inside.

It is a diagnosis that is insanely common nowadays and was extremely rare prior to 2012. Yeah. So I want to ask you a little bit about this term sagging eye syndrome.

I know it's not the most fun diagnosis or people don't want to hear that type of diagnosis that connotes aging, et cetera. Is this issue of divergence and sufficiency and sagging eye syndrome?

Is there something that only happens as people get older or can younger people develop this? Also, especially if they're on their phones or screens a lot, could they also have divergence insufficiency?

They can. Ironically, remember I spoke about convergence insufficiency a minute ago? That diagnosis is becoming less common because people do vision therapy on their phone all day.

Children also can develop divergent sense of efficiency. They can also develop a distance cross, but because they have a tight tricep because their outside muscle still functions well, they're more resistant to the over contraction of their inside muscle.

And they usually have larger abilities to fuse images as they start to misalign. So children and younger adults seem to be somewhat less effective because they can combat the tightness a little better.

Yeah, I want to share one story related to near work that you were mentioning, Dr. Kemplo-Terra. I had this one patient who was in her early 30s, and she was in law school.

Prism Glasses and Surgical Treatment

So she would spending hours and hours a day studying like way up here, like very close. And then she started to have double vision for distance. She actually ended up, despite her very young age, she ended with divergence insufficiency.

It's interesting that you brought that up. I hadn't quite put it together with all the near demands of our daily lives, how the syndrome is becoming more and more common because of that.

And my practice is in Manhattan. So I would say the average Manhattan or New York City patient spends more time indoors than somebody in the suburbs or in a rural area.

They're constantly in an inner environment. I did see, and still see a spike in, the amount of patients who come in because the pandemic caused many people to work from home, which again, increased their needs for near work.

So these are people who worked eight to 10 hour days on their computer and then turned to their phone for another two or three and rarely went outside.

So. The initial instance heightening of this. double vision at distance phenomenon that was caused by the phone has been exacerbated by pandemic response.

So interesting. Yeah, it seems like the conversions of multiple factors that have led to this rise in divergence and sufficiency. Let's say a patient has being diagnosed with this divergence insufficiency or sagging eye syndrome.

What are the treatment options available to them? What do you typically do for them to help alleviate their double? So again, those three options, exercises, prism or surgery still exist.

They don't seem to work as well, the non-surgical ones. And the reason is they tend to be more uneven. So they're worse in side gaze and they are often asymptomatic with no double vision at near.

So the prism glasses that they wear can reduce or help them in the primary position when they're looking straight ahead. But you need to have a little more prisms in this position or this.

So we always try prismatic glasses first, especially for a small angle deviation. If the deviation grows to a certain level and becomes very uneven, they are a suboptimal way.

Many of these people are younger. wear contacts, had lay sex, have gone through these measures to get rid of glasses, and now I put them back in prism glasses.

So it's not often a younger adult patient's desire once they reach a certain level of double vision. The second vision exercise is, again, not as useful as the opposite because We're really designed to pull eyes in, we're meant to converge.

We don't really have a great mechanism to teach divergence. You can teach it through vision therapy and there's some successes, but we are just not wired that way.

So you certainly can't get as far with vision for divergence as you can for convergence. And the longer this distance double vision goes, the tighter the inside muscles are getting, and the biceps are just getting tighter and tighter, if you will.

So ultimately, most people who have a significant angle of deviation end up having strabismus surgery to loosen the outside muscles. And what is the success rate of this type of surgery?

If you operate on a patient, how long can the benefit last? Is it forever or may they go back and have the same issue after a certain period of time? So mechanically, what we do in the surgery is release the attachment point of the muscle and reattach it closer to the origin, like taking a rubber band that's taut and taking one end towards the other.

You create a little slack in a line with less tension. So the muscles re-attached to their globe, and that is a permanent change. If I move your muscle four millimeters, for example, it's forever moved four millimeter.

It will always be better by that much. Now, over years, that muscle can re-tighten if people don't take more breaks during their work day on the computer, et cetera.

We try to change our behavior just a little bit, get outside more, look outside, more those types of things. But you're always going to be permanently improved by that much.

The success rate is very high. And in adults, I use a technique with adjustable sutures. So basically I move the muscle to where I think is optimal. Most people undergo general anesthesia for this procedure if they're healthy.

After an hour or two in the recovery room with modern anesthesia, they're almost completely awake. And once they are really wide awake, I can assess with good accuracy in their recovery how close I got.

Divergence Insufficiency and Sagging Eye Syndrome

If it looks like it's really close, then we leave things be. It looks we did too much or not enough, you just go back and slide this adjustable knot. on the muscle end, giving you greater or less effect.

I do that in the sterility of the OR with the patient mildly relaxed, but there's no discomfort there. And the analogy would be somebody hemming your pants, and you go to try them on after they're hemmed, then they are a little off.

There's a mechanism that the tailor can just adjust the hem right then and there, success rates almost 100%. Oh, that's incredible. And it's so reassuring to hear that there are solutions and with really minimal side effects or risks and a really high success rate.

very reassuring. I'm sure many people are going to be relieved to hear that. Dr. Kemplatero, in our last few minutes together, I wanted to ask you, is there any common myth or misconception about strabismus or misaligned eyes or double vision that you've heard a lot from your patients, and you would just love to dispel that myth today for us on the Eye Health Summit?

Sure. One is patching. The patch is used to fix vision loss that was caused by eye misalignment. So amblyopia and strabismus are sisters. One begets the other.

But they're not the same thing. And in some cases, once the vision is restored, a child can use their 3D system of vision to lock their eyes together.

In some case, the patching improves not just the position, but in the majority of cases the eye-misalignment has to be treated separately from the visual loss.

The patch is a complement to surgery, usually in lieu of surgery. So it's almost like a two-step process, you're doing them in parallel, correct? Some children may still need to patch even after surgery.

Isn't that the case? Certainly. And glasses alone can sometimes alleviate certain forms of eye misalignment. If a prescription is rather high, it often changes the position when you place a child or even adult in a pair of glasses.

So the treatment for double vision is a combination of patching, exercises, prism, and surgery. I love that. That's so wonderful to hear. I know that as people are listening to this and you're going through that stepwise range of options, treatment options.

They may be wondering, is there anything else they can do aside from being outdoors more, spending less time on their phones? Is there any thing people can from a nutritional standpoint or supplement standpoint to help with double vision or strabismus?

What's been your experience? I'm lucky to be talking with one of the foremost leaders in ophthalmic and general nutrition and vitamin health and you, Dr.

Branick. So I should defer to you on most of these things. I do think that a healthy diet certainly allows for optimal visual function, and that includes muscle function.

What do you think? I agree with you. You know, what you're alluding to is that, a health diet is paramount to healthy vision because there's so many other parts of your eye that need to supported.

Yes, supplementation may be appropriate for some people, but you can have the best diet and you take all range of supplements to support your health, it will probably not help your double vision go away and your strabismus go on its own.

The one exception to that, I would say, is if someone has double vision that's transient due to a small stroke to one of the nerves that is going to the muscles of their eyes, either from diabetes or high blood pressure, yes, dietary changes there can help, but that more of a long-term kind of prevention strategy rather than in the acute short term.

It's not going change the ultimate outcome of that particular episode of double-vision. That's my answer.

Surgery Outcomes and Common Myths

But do you agree with that? Yes. Yeah, that's most of us in the eye care world will probably say the same thing. Dr. Campbell Otero, thank you so much for your time and for sharing your expertise with all of on the Eye Health Summit.

I've really enjoyed learning from you, as I'm sure many of our listeners have. If anyone wanted to learn more from your perhaps even become a patient, let's say that they're in The New York area, how could they find you?

Oh, my office is in Midtown Manhattan. It's Pediatric Ophthalmology of New York. And I hope you never need us, but we're happy to help you if you do. OK, wonderful.

We will definitely include the links to Dr. Kemplatero's office and his information below the interview. Again, thank you, Dr Kempletero. we are so honored and grateful to have had you on the iHealth Summit.

I want to thank the rest of you for joining us for this episode and stay tuned for our next session. Thank you so much Dr. Banach for asking me to participate in your beautiful seminar.

You're very welcome, thank you. Thank you for tuning in to the IQ Podcast. I hope you enjoyed today's episode and learned something new to help you boost your IQ.

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Until next time, keep your vision clear and your iQ sharp.