JHU Neuroplasticity Study

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SPEAKERS
Announcer, Ashley Biggs

Announcer 00:01
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Ashley Biggs 00:20
Well, hello, everyone, this is Ashley, again with the LBPD Guest hour. And I am so excited because today, we have three very special guests who are going to wow and amaze us with some science. The cool thing about this is I had a chance to, it's been a minute, but I had a chance to meet them at the NFB annual convention, and the neuro plasticity and Development Lab at Johns Hopkins. They just they just do so much with these various studies. And one of the things that they do is they investigate how lifetime experience shaped the human brain. And they're interested in how it adapts to the absence of vision. So to answer the question, they're constantly doing neuro imaging and brain scanning the brains of individuals who have different life histories, people who are born sighted became blind, those were born blind in those who are currently sighted, and they actually stopped by the library and gave us a little blurb about the about this neuroplasticity lab, and it was just, it was really cool to hear all about it. So I thought it was fun to share, bring it on, bring everybody on board to come and talk about it. My first thing to say is that that's a long, big long explanation for what it is you all do. And if you wouldn't mind, tell me what did I get it right? Is that everything that you all do?

01:56
That sounds great. So my name is Marina. I'm the director of the neuroplasticity and Development Lab at Johns Hopkins, and an associate professor here. And yes, that is what we do. That's a great description. We're interested in how people adapt to their particular experiences, because that's one of the things that's fantastic about humans is that we can and do adapt to a variety of ways of living in lots of environments and to changes in our bodies. And so one of the main things that the lab has been studying for the past 10 years, is how the brain and the mind adapts to blindness and odor, although

ways that we do that, how we learn about the world, through language, how the brain does Braille reading, so a variety of topics. And some of those projects are currently ongoing, and we can talk about them in more detail in a little bit.

Ashley Biggs 03:02

And next we have

03:03

Hi everyone I am Dr. Liz Mcrainey I am I'm a postdoc in the lab. So what that means is that I have my PhD I moved here from Australia in 2020 to work with Marina on in the lab on these projects. So I have my PhD from Australia. And I'm sort of a junior researcher. So I came here to work with Marina and learn from her and to work on these really cool projects. I guess I'm interested broadly in this question of nature nurture, that's what we're really talking about here. And you know, what, how our experiences shape, you know, everything in our life and what's what's shaped by experience and what isn't and what could have changed or you know, would be changed and what couldn't be so this lab has given me a really wonderful opportunity to, to look into those questions with these, you know, very special people that I've met from the blind community. And I've learned a lot about neuroplasticity, specifically since starting here in the lab. And finally

Ashley Biggs 04:06

we have

04:08

I am Shreya young Smith. I recently joined the neuroplasticity lab in October of 2022. And I am the research subject coordinator. And so I am blind and I had an opportunity to participate in this study. And what interests me the most is how we compare the absence of vision with sighted and non sighted individuals when looking at how the human brain is shaped and how we think when dealing with neuroplasticity. And so I can truly say that I love working with the neuroplasticity. City Lab. My duties are to send out the announcement to the library and the National Federation of the Blind along with doing the screening, screening interviews. And I love it. It's enjoyable. It's interesting, because every day, it's a new experience, and you're able to learn something.

Ashley Biggs 05:24

Wonderful. Thank you guys for introducing yourselves. I know that you guys have a wide and varied backgrounds, and but how did you all manage to connect at at the at this lab? I mean, it's it sounds already, like you guys are pretty, pretty amazing crew,

05:48

we do have quite an amazing crew. So this is only three people out of our lab we have. There's lots of lots of other researchers working in the group. So we have four graduate students in the lab right now, who aren't here, we have a lab manager, we have an amazing master students that just joined the lab and a bunch of undergraduates. So we have a really, really fantastic, fantastic team. So we're all kind of united behind that idea of studying brain plasticity and characterizing the experiences of people with different life histories, right people who are blind, but we the lab. So today, we're going to be talking about plasticity and blindness. But other people in the lab work with populations with other different kinds of experiences. So people who are computer programmers, for example, so the brain adapts to blindness, the brain adapts to learning to program, which is something we didn't evolve to do people who are interested in deafness, and neuroplasticity and learning assigned language. So lots of different kinds of stuff goes on in the lab, but working with people who are blind is a major, major research direction in our laboratory.

Ashley Biggs 07:04

So can I ask for a definition? What is neuroplasticity? I think I have a general idea. But I keep thinking of it as like the Silly Putty of the brain. But I'm sure that that's not quite true. You know,

07:20

you're asking a great question. And actually, I sometimes find that you know, these concepts, I'm going to give you some ideas, but I will also say that this is a question that neuroscientists and cognitive scientists struggle with. Because there really isn't agreement about exactly what neuroplasticity is. And sometimes, there's even kind of debates that about what it what how we should define it and what it means. And then you know, one person might mean one thing and another might mean another thing. So I will tell you what I think of when I think about neuroplasticity, so when I think about neuroplasticity, I think about the capacity of the human brain to adapt to a particular experience and environment. So we're born into the world with ready brain, right, our brain is ready to learn a language and ready to socialize with people and ready to reason and ready to, you know, think numerically ready to think in all sorts of ways that are sometimes particularly human, right. But it's also the case that different babies are born into different worlds, to some degree, right? Some babies are going to be born to live in the rainforest. And in a small hunter gatherer society, some babies are going to be born in New York City, some babies are going to be born totally blind, some babies are going to be born deaf and ready to learn a sign language. And so all of those brains one of the qualities I have in common is that they're plastic, right? So during development, the human brain is particularly flexible and ready to learn. So I think of in this particular case of plasticity as this capacity to change in response to the environment and learn the things that we need to learn to thrive in our particular niche, right in wherever we land.

Ashley Biggs 09:28

Okay, so it is like somebody

09:31

you too far off.

09:34
Do you have any thoughts about neuroplasticity that you want to add?

09:37
I guess the one thing I I agree with everything you just said I guess the one thing I think is worth mentioning is that the term and the field of study really comes from a place of what in some ways comes from a place so the fact that in most the kinds of research that that We do. And when I say we, I mean, cognitive neuroscientists. So that means how people behave and think and what happens in the brain to make that happen. That's a very broad version of cognitive neuroscience. But for the most part people study, a very small proportion of the human population is to do that, right, they study people who can see and hear and who are in a western society more often than not, and all these ways in which science has, I think, develop these theories about humans, and not just humans, but in this case, humans that are based on a very cookie cutter A could say, version of a human and, and that that's just one version of the Brain and Mind that, you know, that that could eventuate from a baby. And then in this case, I guess we're talking about neuroplasticity in in asking, like, Well, what else? Aside from this cookie cutter version of a human that are more often than not studied in this in this field? What else could happen? How could the Brain and Mind develop in different ways? So in I guess, I just mean that, in one sense, we're talking about plasticity as a deviation from typical. And in a way that is, I think, it's a key that funding is is, you know, diverted to like the most typical version of a human, I suppose. But it doesn't mean that that's the full story. So the idea is to, to see what else could happen, like, what how else could the brain develop? Or how else could a human develop in ways that aren't these most typically studied people? And what does that tell us about our species and, and the brain? And yeah, does that make sense?

Ashley Biggs 11:53
Yeah, that makes sense. You, you talked about how it's not a cookie cutter thing, and that people come from all walks of life. So tell me a little bit about the people who participate in the various studies that you do, I'm

12:11
sure. Um, so I mean, the lab as Marina said that the lab has a bunch of different sort of streams of research, and we study different populations of people. For me, personally, my research since joining the lab has been around people who are born blind. So by that, I mean, people who are totally blind from birth, the lab has also done research before with people who became blind later in life. But for my particular studies that I'm working on at the moment, I'm studying people who are totally blind from birth. So I guess going back to sort of what I was saying about cookie cutter is that the most of most cognitive neuroscience who study the brain study people with vision and hearing, and there are in the case of vision, there's a big bunch of the brain that is thought to do vision. That's thought to be its primary purpose. So I guess the question is, in in someone who's born totally blind, what happens to those areas, right, I think Marina use sometimes quote, was in their adoptive for many decades ago

who decided with that, even looking into it, that those areas would just sort of with the attributes the word basically that they would rush away. Now, of course, That's complete nonsense, they don't run away. They're perfectly useful and usable and used. They're just used for different things, right. They're not used for vision, they're used for other things. So broadly speaking, that's what my my research is looking into. Particularly my I have some neuro imaging research that I'm doing at the moment that's looking into certain areas that in sighted people are thought to do vision and be specialized for recognizing different types of visual objects around around that human being. And so the question is, what happens to those areas in someone who is blind from birth? And in other ways, I'm interested, I have another study that's looking into more about hearing about blind people's experience, right? So what I really mean by that is that, for example, blind and sighted people, for the most part, have the same access to touch information about around the world. But you know, objects around a person, a sighted or a blind person, they we couldn't touch the same things, for the most part, but we use that information differently, and we attend to it differently. So some of my research is also about how using information from different modalities, not just visually and influences how we understand those things. And, and that's really about the sort of sensory experience of a human, blind or sighted. But also, you know, sensory information. So touch and smell and sound is not you know, the only information that humans get, we learn a lot from other people around us and hearing other people talk about things around us. So, for example, some of the studies that the lab has done shows that blind people play people who are totally blind from birth, I know plenty about visual things they know about color, and they know about shapes that they can't touch, and they know about sunsets, and they know about all sorts of things. And they can't directly experience with their senses. So so the role of language and communication has been a big focus of, of the lab, to show that these things can transmit information and teach people about things that they can't access firsthand, I suppose

Ashley Biggs 16:04
you've reached out to the blind community before, to have people participate in the study. And one of the things that you and I had discussed previously, is that you wanted to share the results. So I know it's probably way too early. But is there a sneak peak? Is there? Is there like a little preview that we can have?

16:28
Um, yeah, okay, let me think. So there's a few things that I could tell you about. I mean, something that has been shown in more than no more than one study is that these these areas in a blind person's brain, when again, what Sorry, I'm using the word term blind. But I really mean, in the case, I'm meaning someone who is totally blind from birth, which I understand is not all, not all blind people, that's a very small proportion of blind people, I understand that. But in this case, I'm talking about those individuals that we've studied, the areas in those people's brains that in a sighted person would do vision are taken on by other functions. And in some, in some cases, they might do a similar sort of job, but in a different modality. So for example, there's a, there's a part of the sighted person's brain that's thought to have a role in processing visual motion, so when an object is moving in front of them, and a similar area of a blind person, a person born blind, and their brain might do the same job by using sound. So that area will process sound move, like movement as since through sound vision. So in some cases, you know, these regions are sort of repurpose for a similar type of role just using different information. But in other cases, the, the role of those areas of the brain are very different. So for

example, a bunch of sort of, quote unquote, visual areas take on a function for language, which again, speaks to how important language is for all humans. But in this case, it it has been shown in science to be important for teaching people about things that they can't directly experience. So that's something cool that this research has shown, there's plenty of cool things happening in these you know, quote, unquote, visual areas that aren't used for vision. Another thing is, I guess I've shown that in my surveys about, you know, touch information that both sighted and blind people use that there's really high agreement right between sighted and blind people in terms of their rating of, of touching objects, and what they think they could tell about different objects from touch. And also, there's really high agreement between what sighted people say they can tell from viewing objects and what blind people say they think sighted people can tell by viewing objects. So that also goes speaks to what I said earlier about, you know, that, that it's, I mean, I'm sure that blind people already know this, but sighted people like us, were still, you know, trying to understand certain things. And one of those things is that they know plenty about visual things even that they haven't experienced themselves. And it's so cool. Yeah, it is cool, isn't it? I think it's really cool. And I'm, as I said, I think most of neuroscience and cognitive neuroscience really focuses on this cookie cutter version of a human but I think that if if science were to, to only look in those people, then we're really limiting ourselves in terms of science and what it can tell us. So I think it's really cool that we can that we have this lab has the opportunity to to try to extend the knowledge further than, you know, this cookie cutter version of a human being.

Ashley Biggs 19:51

That is very, very true. I, you know, I look forward to the day where the world is much more accessible than it is now. So that my friends and colleagues, we might we share the same language, but I also wants to share the same experiences. So I'm looking forward to that day. And it sounds like through this, through your study, the use of language is helping to make that day even even make that day happen, that we, that we can do that,

20:26

I think talking about these things is, I mean, I'm not just meaning in, in the way that we study, like the effect of language for human beings. But on a personal level, I think talking about these things is only going to help help increase other people's understandings that, you know, that of other people's experiences that beyond their own,

Ashley Biggs 20:46

you guys use neuro imaging, yes. To do. What is what is neuro imaging? And? And how does that affect what you're able to all the outcomes that you're finding? Oh,

21:02

yeah, that's a really good question. So we use functional MRI. So MRI means magnetic resonance imaging. So basically, we use a very big magnet to take lots of images of the brain. And we do that over time. And essentially, essentially, we take images of the brain over time, while people are doing

different tasks in the scanner, so we can see where the blood is going during different while they do different things. So basically, that means we can tell which areas of the brain are important for certain things and not other things. So this is a really, really cool tool that we have at our disposal. And we've learned and mean this, this technique in neuro cognitive neuroscience has really exploded, I guess, in a way in the last, what, 20 years or so. But it's so it's very, very cool. But also, it's like a lot of science, a very slow moving, it's slow to, should give us evidence, because an experiment can only include so many things at one time. So one experiment might show might let me think what's a good example,

22:19
one of the topics that the lab has looked at is the neural basis of Braille reading, like what parts of the brain what systems of the brain are used in reading braille. And on the one hand, this is a topic that's been researched since fMRI was first invented, right, so some of the earliest studies were done with people who are blind reading braille. And this is how we discovered that visual parts of the brain were being reused or repurposed or used by people who are blind to do non visual things is that they're active during brow reading. So it's been studied for a long time. But actually, despite that, our understanding of the systems that are involved in Why is still quite limited. So for example, it was discovered at some point that the part of the brain that sighted people use to read visual print, sometimes called the visual word form area is also active, and people who are born blind during Braille reading. But actually, as it turns out, although it's also active, it may be doing different things and people who are blind and sighted, and one of the things the lab has been looking at is whether parts of the brain that are near touch areas are actually particularly important for reading braille. And so despite the fact that we've been imaging people who are born blind for, you know, 20 years, including umbrella reading, depending on exactly the kinds of comparisons. It turns out that you we don't know, there's a lot. There's a lot we don't know. And, you know, one of the things that Liz brought up is that there's kind of this, we have a lot more evidence from the so called cookie cutter person than we do from people with varied experiences, right. So we know a lot more about visual reading that we know about Braille breeding, reading, in terms of neuroscience. And there's a little bit of this kind of tendency to just assume that what holds in the visual case is going to happen in the case of Braille. And so I think that's part of in some ways, what has slowed down progress, because people are ready to jump to the conclusion. Oh, look, the same part of the brain is active sometimes, in these two populations, they must be the same, let's move on. But there's all sorts of interesting things that have to be discovered and lots of different comparisons that have to be made. And so that's one of the kinds of things that Liz is doing right now when other people in our lab and other labs are working on right now.

25:05
Yeah, thanks, Marina. And I guess another is to add on to that, like Marina just said that, you know, places in the brain that are important for touch are involved in Braille reading. I mean, and that sounds so obvious to say that it is it's like, of course, it's shouldn't be involved because people use touch to read Braille. But the literate, the research has been done haven't hasn't even focused on the touch areas, because they've been focusing on the same areas that visual reading users. So that's an example of this sort of slowness that I meant, and as you say, Marina, that the particular things that you include in an experiment to make comparisons across them, determines what you can conclude from a study. So it takes a lot of different studies that include a lot of different things, to enable us to, to, you know, to assert that we really know something to be true.

Ashley Biggs 25:58

It sounds like this is part of the reason why the project is continuously ongoing. Yes. Studying for 20 years, and you're you're still haven't

26:06

even looked in the touch areas haven't even

Ashley Biggs 26:09

looked into the touch areas. And then my question, my question, because our library serves not only those who read Braille, but those who read via audio formats, you know, how does that affect the brain of someone who is visually impaired? Because, um, you know, I know, I remember reading one study a long time ago, where they were saying audiobooks, you know, activate the same parts of the brain as print books. And then another study came out and said, No, it doesn't. And, you know, and it's like, what do we really know? Do we really know what it sounds like? 20 years in, into these studies? We're just now finding out are just now getting started.

26:53

Yeah, I think that's true. And I think I mean, I don't I haven't read anything, specifically on audio books, I guess. But I mean, spoken languages, for for, for hearing babies, you know, the something that they start to learn very young. So spoken languages is sort of this. There's something innate, I would say that makes a human baby, learn spoken language and understand it, and then learn to produce it themselves. Whereas reading is something that we learn in school, right? You, someone needs to teach you how to read. So the system, although it's all sort of language, the systems that do spoken language and written language are overlapping, but different. And this is I think, this I mean, this we could get into discussion of why Braille reading is important, even though I mean, I've heard some people ask me, isn't Braille reading kind of on the way out? Do we really need? Like, no, we do we absolutely need. People need to let you notice. It's literacy. It's a different thing. And it's important. So

Ashley Biggs 28:01

oh, that that's like a knife to my heart. Anytime I hear that. Yeah, I think no, no, Braille is Braille is so important. Because not only is it in a way to access another way to access the material, but you know, it's a it's a way to actually physically connect with the material. Do you know what I mean? And that's so important. Yeah. So if the studies are ongoing, and the studies are, you know, or do you still meet people

28:34

on a regular basis, do we, I mean, we always need people really eager, are very eager, we'd love to hear from anyone who's interested, we do have, as I said, we do have quite a strict I guess, criteria for who we can include in, in our studies, which the main reason for that is practical, sciency reasons. But as I said, I am looking for people who are totally blind from birth. For the studies that we're doing at the moment, yeah, as I said, sometimes we do also look, study people who became blind later in life. And and I guess the difference between those two people from from the scientific plasticity perspective is that baby's brains are very, very plastic, right? So they can adapt very easily, it seems to all sorts of different experiences, whereas adult brains don't do that as easily. So part of this part of these sorts of research into people with different experiences is, Where's where's the point at which that changes? Right? And that's more of a it's not so much a question about blindness as it is about the brain and how does it when does it stop becoming so plastic and when is it set? When is the human? When is it so hard for that brain to to adapt that it's going to be difficult for that human whereas if you know the change happens when the child is very young than Susan's It'll be difficult neurally for things to change. So we have those two different different types of questions that we're looking into at different times. But for the moment, yes, it's true that I am recruiting people eagerly, and that at the moment, I'm only looking for people who are totally blind from birth, because of these kinds of questions that we're trying to answer at the moment in the lab.

Ashley Biggs 30:22
And that's where we would bring in. Sure, yeah, urea? Yes. So

30:28
we are, we would be absolutely delighted to have participants in the study. And we have a bunch of studies going on in the lab, tactile perception and Braille and reading and spoken language comprehension. There's lots of stuff going on in the lab. And if if someone's interested in participating, they can either get in touch with the lab via email, or via phone, and then Sherea Sherea. Do you have the phone number handy for our lab and the email address? Or how should we,

31:04
the phone number is 410-870-9895. And the email is,

31:16
so it's plasticity_lab@jhu.edu. And so anyone interested in hearing more about the study or interested in doing a screening interview should contact that email or phone number, and Sherea. Will has a hole in that interview of questions that she will ask to see if you qualify for the study. And just for completing the interview, as just a thank you, we send a $15 amazon gift card, we're very eager to have anyone reach out. Also, if you know of anyone, even if you yourself, don't think that you qualify for the studies. But you know of anyone if you could spread the word about the research, it would be an enormous and enormous help to us. And we would very much appreciate it. But also, you should feel free to reach out just to learn about the research and Sherea can answer questions about the studies. But also, Liz and I and other people in the lab our year to talk to anyone. The other thing I guess I should mention is that you can learn about our research online as well. If you're just interested in reading more, if you go to bed, mi lab.com, that's B EDNYLA b.com bedni lab.com. So you can learn more about the research

there. And there's also a link on that website that says participate, where you can get more information about taking part in the studies.

Ashley Biggs 32:55

Three a Could you repeat that number one more time,

32:58

the phone number is 410-870-9895.

Ashley Biggs 33:07

And since you're the person that they would speak to, they shouldn't be afraid to talk to you right? Because you are you are the go to gal for this.

33:17

Absolutely. I'm definitely a people's person, and I enjoy helping people and speaking with people. And so I am honored to speak with any and everyone who gives the lab a call.

Ashley Biggs 33:29

That is awesome. Because I know that a lot of times people who want to sign up for things are always like, what's it gonna be like? So, as a as the as the coordinator? Can you give a little bit of detail about what their experience might be like, when they ask if they've gone through the interview process?

33:51

So we have a pre screening interview, and I would ask them questions like, Have you been born blind from birth? What is the cause of your blindness? And then I would proceed with the screening interview and asking questions like what is the cause of your vision? So we ask questions concerning vision, and we ask questions concerning your health history. And then after we take the answers, I have to enter them into a spreadsheet. The office would give you a call and schedule an appointment to come in and do the interview. I'm sorry to do the research study. And when you come into the office, you're either going to listen to stories through a headset, or you're going to read the Braille on a Braille display. And you're going to answer questions. You also will have to feel different objects. Explain what you're feeling or what you're hearing And then you may have to go through an MRI, if that's what you choose to do. We also have the MRI study that was mentioned earlier, where you go through a scanner, and you listen to various things in the scanner and tell what you're listening to. So it's definitely interesting. And if anyone has any questions, I'll be more than happy to answer them. And if I do not know the answers, I will get the answers and those answers.

Ashley Biggs 35:30
Okay, so it's not it's not a painful process, then because, you know,

35:35
I hope not

35:38
very easy. It's fun. Actually, I think, people I can speak for myself, I know, when I went through the studies, I did not do the MRI study. But I did have the opportunity to listen and feel different objects and use the Braille displays and reading braille, listening to sounds, and it was fun, it was a learning experience as well as enjoyable. And I'm quite sure it's the same with the MRI experience as well, we do have several individuals who have gone through the MRI experience, and it was not painful. It was fun, and enjoyable. And they say things like, we definitely appreciate the study, we thank you for the gift card, it's quite useful. And they have referred other people to participate in the study.

36:28
I should add also that, of course, we compensate people for their time if they choose to participate. So people are paid $30 an hour for the fMRI studies and $20 an hour for the behavioral studies. And we can cover the cost of transportation to the lab, if people choose to take part in the study as a as a just a sign of appreciation for their time.

Ashley Biggs 36:53
That's pretty cool. And it sounds like again, not painful at all.

37:00
Because I would hate for people to think that it wouldn't be okay.

Ashley Biggs 37:03
Yeah. Well, I mean, you know, there's I've never participated in any study like this or anything, but there's always that like that, that perception of research where you're just going to be sitting there and, you know, gotta be super, super quiet. Research Library? I don't, it doesn't sound like that at all. It sounds like it's a much more engaging, open, welcoming place. Yeah.

37:27
And thank you, Sherea, for explaining that. I agree, I think I think most people enjoy participating. There's different types of studies, or sometimes they're a bit slower, you know, like the Braille reading one is sort of slow. And people feel I could read much faster than this with my, you know, normal braille materials. But other times, it's more like a survey, and we might just sit there with them and ask them questions and give, you know, explain a scenario and ask them what they think they might know, or do

in a situation. So it's, I think it's, it's certainly not painful. And I think, mostly not even boring. So there's a little

Ashley Biggs 38:06

Oh, wow. Well, thank you. And, you know, this has been very, very, very enlightening, and a lot of information. And again, I wrote down that number, so I'm gonna say it again, the telephone number is 410-870-9895. Yeah, address is plasticity_lab@jhu.edu. Yes. And when you connect, you will be connecting with Sherea, who will get you all set up and ready to go? And then you would go on to do some amazing adventures? So is there anything you guys want to add before we close out? Um,

38:54

I think I would just add, I guess, just from the perspective of people who are interested in participating, that even if you call up and you're interested, you know that you don't have to participate, or, you know, you might decide that you want to do the Braille reading one and not the other one, you know, it's all very, it's all completely voluntary, obviously. And even even under the voluntary category there, there are still choices. So even if you're curious, so you're not sure then please give us a call and we'll be happy to explain things further or give you more information. And yeah, I think I think that would be useful for people to hear that I guess. But thank you, Ashley, for having us. That's something else to say we're really like you and maybe like, spread the word a little further to you know, to people who listen and even just to explain our research is a really great opportunity. So thank you for that. Well,

Ashley Biggs 39:50

thank you guys for being here. I really appreciate the three of you stopping by and being part of LBPD IX guest our image actually, we really did so left the hour, so

40:02

you can talk.

Ashley Biggs 40:05

The library, of course is here to assist in any way that we can. So don't hesitate to reach out to us. And I can't wait for this podcast to be released. So thank you all so much,

40:19

much to.

Announcer 40:21

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