

Your Complex Brain - Season 3 Episode 2 - Reduce Your Chances of Alzheimer's. Here's How.

Dr Laura Middleton (00:01):

[music plays] I think when we look at strategies both to reduce risk of dementia and improve the well-being of people living with dementia, modifiable lifestyle factors are really where the evidence is. Physical activity, healthy eating, social engagement, learning, and cognitive activity. I always think both ways to reduce dementia risk, but also ways just to have a rich life.

Heather (00:32):

This is Your Complex Brain, a podcast all about the brain, the diseases that impact it, and the path to finding cures. I'm your host, Heather Sherman, and I have the great pleasure of working alongside the team at the Krembil Brain Institute in Toronto, Canada, a leader in brain research and patient care.

(00:52):

In each episode, we'll take you behind the scenes into our clinics and research labs to meet the game-changers of the future. We'll empower you with the latest research to help you take charge of your own health. You'll also hear from people who are living with brain disease, as well as their loved ones and the care teams who support them. Join us on a journey to unravel the mystery of your complex brain.

(01:23):

[clock ticking] In the time that it takes to say this sentence, someone in the world will develop dementia, a group of symptoms impacting memory, thinking, mood, behaviour, and the ability to complete everyday tasks.

(01:43):

Alzheimer's is the most common form of dementia, [clock ticking stops] and with people living longer, even into their 90s and beyond, dementia is quickly becoming the biggest and most consequential global health threat of our time. [music plays] But, according to a landmark study in the Lancet medical journal, there are 12 modifiable risk factors that can reduce your chances of getting dementia at any age, by 40%.

(02:13):

On the list: Your education level, hypertension or blood pressure, hearing impairment, smoking, obesity, depression, exercise, diabetes, social isolation, excessive alcohol consumption, traumatic brain injury, and air pollution.

(02:34):

Today we're going to talk about which of those risk factors are most important to lower or even reverse your risk of dementia. But first, we'd like you to meet Maria Martinez, a long-time social worker at UHN's Memory Clinic. Maria works directly with patients and their families and understands the benefits of a healthy lifestyle, both for preventing and managing certain aspects of dementia.

Maria Martinez (03:08):

[music plays] My name is Maria Martinez, and I'm a social worker at the University Health Network Memory Clinic, a part of Krembil Brain Institute.

(03:16):

My role as a social worker can be very complex. Primarily, it's to provide counseling and education to the families and patients that I work with. And another big component of my job is to ensure that families and patients are referred to community resources.

(03:35):

I have been working at the University Health Network Memory Clinic since 2007, and my day-to-day work is to see patients when they come into the clinic. Part of my day will be to see patients virtually with the physicians, and then the majority of my time is really spent speaking with families after their appointments and making sure that they have the necessary information about the diagnosis and making sure that they're connected to community resources.

(04:05):

The ways that I try to help my patients and families is really to start where they're at when they show up for their first initial consultation here. Sometimes people are in the very mild stages of their illness. Sometimes we see people for the first time who already have very, very advanced disease. And so my work often consists of figuring out what is the most important piece for them that they need support with.

(04:33):

So if it's just learning about the illness and what to expect in the future, then education is what is provided, and I'll often link them with resources such as the Alzheimer's Society in the area where they live for continued support and education. If they are requiring assistance with day-to-day care, and they're exhausted or fatigued from providing the care to the person with dementia, then I'll set up home supports for them so that they can have assistance with that aspect of care that they're finding most difficult.

(05:09):

It's an interesting role that I have as a social worker here because the patient who comes in who has the dementia is my patient, but most of the work that I do is with the families and the caregivers who are looking after that person with dementia.

(05:26):

The needs of the caregivers vary because it really depends also on the relationship that they have to the person with dementia. The needs of a spouse will often vary from the needs of a child who's looking after a parent. It can vary from day-to-day care, so assistance with their personal care, bathing, dressing, feeding, and then just having the need for supervision, if they can't leave the person alone because they're at risk of wandering or getting lost.

(05:57):

One of the biggest challenges for patients who have early onset dementia is financial. It's a huge burden. Oftentimes they're unable to work. They may have children who are quite young. And on top of that, there are costs associated with caregiving, so it just seems like it's a double whammy for some of the families.

(06:20):

This job sometimes is not very easy, because we see our patients over a long period of time, and we get to know some of our patients and families very, very well, and we see over time they're requiring more and more support. And I find what's helpful to me as a social worker is really to have a very connected team, a team that works very, very well together, and we can support each other during these difficult times when we see that we don't have a cure to offer them.

(06:53):

One of the things that we do try to encourage amongst our team and for our patients and caregivers is to provide them with hope. Hope is what really keeps us motivated to continue doing the work that we're doing as healthcare providers, but also for families to continue to care for the person with dementia over long periods of time. What gives me hope as a social worker working with families is to think that there is some difference that I'm making in this journey in supporting them at home and trying to make dealing with the diagnosis of dementia a little bit easier.

(07:32):

It's incredible, even after working in social work for almost 25 years, when I work with my patients and families, I always learn something new. They're incredibly resilient, they're incredibly resourceful, they're incredibly loving, and it really is a privilege to be involved in their lives. I have learned that it is very important to lead a very healthy lifestyle. And I think we can all engage in reducing our risk factors for dementia. It's something that's very important, so that we can take care not only of our bodies, but also of our brains.

Heather (08:17):

[music plays] Dr. Carmela Tartaglia is a neurologist and a clinician scientist with UHN's Krembil Brain Institute, as well as co-director of UHN's Memory Clinic, and an associate professor at the University of Toronto.

(08:33):

Dr. Laura Middleton is an associate professor, and the Schlegel Research Chair in Dementia and Active Living at the University of Waterloo. She is also an affiliate scientist at KITE, the research arm of UHN's Toronto Rehabilitation Institute. [music fades out]

(08:54):

Thank you both so much for being here today.

Dr Carmela Tartaglia (08:56):

Thanks for inviting me.

Dr Laura Middleton (08:57):

Thank you. My pleasure.

Heather (08:59):

Dr. Tartaglia, I'm going to start with you. I know that you work very closely with Maria Martinez and the other staff at the UHN Memory Clinic. So how important are the supports that social workers in particular provide for patients and their families, especially the focus on healthy living and healthy habits and linking that to a better quality of life?

Dr Carmela Tartaglia (09:18):

I think of their services like a treatment arm. In Alzheimer's disease, just like in other neurodegenerative diseases, we don't have very many treatments available, so having an extra treatment arm is really, really important, and they provide services that we think are integral to modifying the risk of these neurodegenerative diseases, but as well modifying the progression. They're very important services and there's a lot of evidence for them. People don't realize that the interventions that they can help with in

terms of just the activities, social and cognitive activities, as well as physical activities, are really important for changing progression as well as providing benefit for the caregivers and improving quality of life overall.

Heather (10:11):

Yeah, she talks about it being a very rewarding career and not an easy one always, but it's nice to hear that.

Dr Carmela Tartaglia (10:17):

Yeah, she's a very strong advocate for patients. These kinds of treatments are really undervalued. This is where penny-pinching becomes a very costly issue, because when people are not engaged in these kinds of activities, they're more likely to end up in hospital. They are more likely to be institutionalized, which is far more costly than providing somebody with a day program.

Heather (10:43):

Right, and we're going to talk more about that today.

(10:46):

Dr. Middleton, this whole idea of healthy lifestyle being beneficial both for preventing Alzheimer's and dementia, but also living a better quality of life, I know that's a big focus of your work too. So can you tell us a little bit more about that?

Dr Laura Middleton (10:58):

Absolutely. I think when we look at strategies both to reduce risk of dementia and improve the well-being of people living with dementia, lifestyle and modifiable lifestyle factors are really where the evidence is. We don't have good strategies for pharmaceuticals. It's really about living well, and that includes physical activity, which is a focus of my work, but it includes healthy eating, it includes social engagement, learning and cognitive activity. I always think both ways to reduce dementia risk, but also ways just to have a rich life, continuing to be engaged in many different ways.

Dr Carmela Tartaglia (11:42):

I think we underestimate the influence we can have even in people who have genetic diseases that lifestyle interventions can modify the onset age of a disease, change the progression rate of the disease. We cannot change our genes. We also can't change some of the things that happen to us. Brain injury is on the list of modifiable risk factors. Well, once you've had the concussion, even if it's mild traumatic brain injury, that can increase your risk of dementia.

(12:13):

So what does that mean? You can't erase it. But it does mean that you have 11 other risk factors that you could focus on to mitigate that risk that's already taken place. I am a strong advocate of finding these interventions for people to be able to mitigate the risk of, let's say, the progression rate, because in our case, many of them already have the neurodegenerative disease. That's why they're in our clinics. So what are we going to do for them? We can help them focus on the things that could change the progression.

Heather (12:47):

So why don't we just step back for a moment and talk about the genesis of this idea of risk factors and the Lancet study.

(12:59):

What are some of the more significant risk factors that people can actually control? And let's talk a little bit about the genetic part as well in terms of what we're learning about the genetics of the disease and how much earlier we're learning about the disease and its progression.

(13:16):

Dr. Tartaglia, do you want to start?

Dr Carmela Tartaglia (13:19):

It's always important to think about our genes because that is what dictates a lot of who we are, but it's really important to remember that your genes; you, interact with your environment. And so that's where that study is really important because it's about all the things that basically can happen to you or that are part of who you are and how those other things dictate or influence your risk of dementia. So on that list is vascular risk factors, like high blood pressure, things like smoking, and then physical activity, obesity. There's other types of factors like depression and social isolation, things that we need to focus on. And then there's education. So there are things that we have some control over and can change our risk.

(14:14):

The genetic forms of Alzheimer's disease are quite rare, but the genetic forms of other diseases, like frontotemporal dementia, are actually quite significant. But in both of these cases, these lifestyle modifications can alter the onset as well as the progression.

Heather (14:32):

Does it matter the type of dementia that you may be diagnosed with in terms of how much control you may have over some of the risk factors before you're diagnosed?

Dr Carmela Tartaglia (14:42):

Yeah, for sure. In Alzheimer's, there's not such a significant genetic mutation, one gene causing the disease, but there's obviously a genetic predisposition with APOE ϵ 4 where your risk is higher. In FTD, frontotemporal dementia, there's really a much higher genetic risk related to genes.

(15:03):

But when we think of vascular dementia, well, yes, there are rarely some genes, but mostly it's a disease that's related to your lifestyle. So, you have great influence on your risk of vascular disease dementia, and the progression of that disease, because basically, you could alter your lifestyle. Your diabetes could be better controlled. Your cholesterol could be better controlled. Your high blood pressure, you could stop smoking, or drinking alcohol are less than two per week, so that's news to a lot of people. So vascular disease dementia is almost a preventable disease.

Heather (15:43):

Is it ever too early to think about prevention techniques, Dr. Middleton?

Dr Laura Middleton (15:48):

No, absolutely not. I mean, some of the risk factors that are mentioned in that Lancet paper are things like education, which obviously is not only, but primarily in early life. And there's other elements like physical activity, being overweight, that primarily are risk factors in midlife, but also are influenced later in life. Hearing impairment in midlife is a risk factor. So looking after all of these factors across the life course right from early life through is really important.

(16:23):

We had one study, and it was in a population looking at exercise levels across the life course, but when we looked at teenage, age 30, age 50, and light life physical activity, it was teenage that was most predictable. Everything was associated with your risk, but teenage physical activity was most predictive.

(16:41):

So I wouldn't say drop it off and give up hope, but the earlier you start, it's probably better. It's all working on the condition and health of your brain, and that's cumulative.

Heather (16:51):

Right, and we talked about physical activity having an impact on brain health as well, and I know it's a big focus of your work, Dr. Middleton, looking at exercise and nutrition specifically. I know that you recently developed a new program for those living with dementia in an eight-week program. Can you tell us a little bit more?

Dr Laura Middleton (17:09):

Absolutely. We call it the DELIGHT Program. It's the Dementia Lifestyle Intervention for Getting Healthy together. It is, as you said, an eight-week program of physical activity, and then I'd say shared learning. So, healthy eating is one major topic in it, but we also talk about sleep, about social engagement and support, about mental well-being as well as physical activity outside of the exercise class. This is a program that we co-designed with people living with dementia, care partners, healthcare professionals, community service providers early in the pandemic. We managed to get people together. We got them on Zoom. We met together and designed this program.

(17:53):

So, we've been piloting it over the last couple of years and now have a grant from the Public Health Agency to implement it in our communities. And it's really meant to give people a sense of hope, not that dementia is going to go away, but for a living as well as they can day-to-day, and to empower them with strategies to improve their health and well-being while living with dementia.

(18:18):

Our pilot work has been very optimistic. This sense of empowerment is really something that came through. I think a lot of people, when they get a diagnosis of dementia, feel a sense of loss and despair. We've had people say that, "I didn't realize these things were for me anymore. Physical activity, healthy eating, I didn't realize they'd benefit my well-being even though I have dementia." And so that's really changed their perspective on how to live well day-to-day and get the most out of their life while living with dementia.

Heather (18:51):

What are some of the benefits that you're seeing as part of the program?

Dr Laura Middleton (18:54):

The results we have right now are pilot, and we're evaluating as we're implementing. But we've seen improvements in physical function, of course. We've seen improvements in well-being of people living with dementia and quality of life. We've seen improvements in social connection and feeling of still being involved in their communities.

(19:14):

When we've interviewed people as well to understand what their perceived impacts are, they really talk about one - realizing the impact on their everyday life. So people have talked about, "I was using a walker, and then I went to my medical appointment to get a scan and I didn't need to use a walker." There's someone who talked about, "I've always done archery, and I couldn't do archery anymore, and now I can do archery again." And that seems like a little thing, but it's really meaningful if that's something they've done all their life.

(19:44):

Other people have said, "I've really gone from thinking about the end," and what they might do, and planning for the end to realizing that they really can live quite well day-to-day, even if it's a progressive disease. And we don't want to avoid talking about that, but that you can have joy day-to-day, you can have connection, you can live a meaningful life.

(20:06):

And so, I think it's really both made them healthier but also really changed their mindset, which I think is so critical.

Heather (20:13):

Amazing. What about the connection between exercise and our brain chemistry and the impact that it has on improving serotonin and dopamine and all of these other things that make us feel better? What do we know about how it actually changes our brain in such a way that can actually help protect against dementia and Alzheimer's and other neurodegenerative diseases?

Dr Carmela Tartaglia (20:35):

There's actually a lot of good evidence that aerobic exercise can actually change things that are structural. Everybody thinks, "Oh, of course exercise is going to be good because you get better blood flow." Of course, you get that. What you also get is these trophic factors. So these are things that get released with aerobic exercise. And when we're talking about aerobic, that's where a lot of the evidence is, more for aerobic exercise. Things like sitting on a stationary bicycle, swimming, dancing, elliptical, these are things that get your heart rate up, that you can increase factors in the blood that will increase the number of blood vessels in certain parts of the brain. There's also evidence that you can increase the number of synapses, which is basically the connection between cells, and actually that's how you learn. So there's a lot of evidence that these tangible things are happening when you do aerobic exercise.

(21:34):

We're optimistic in Alzheimer's disease. We have some drugs that, although are not the miracle cure, the home run we want, are moving the needle. They're moving in the right direction. Those interventions could be combined.

(21:48):

When you think of cancer care, people have always a number of interventions together.

Heather (21:53):

It's like a cocktail.

Dr Carmela Tartaglia (21:54):

Yes, exactly. A cocktail. And the cocktail could be the disease modifying drug, as well as this lifestyle modification, so that you could get more benefit. One needs to remember that Alzheimer's disease is not just dementia. Alzheimer's disease starts 20 to 30 years before you show any signs. And then you have a period where you have maybe just subjective cognitive impairment where other people can't even pick out that you have changed. And then you have mild cognitive impairment. That whole spectrum, even before you get to the dementia stage, are times where these lifestyle modifications that Dr. Middleton is talking about where you could be changing that progression.

Dr Laura Middleton (22:41):

I agree completely that the broadest, deepest evidence is for aerobic exercise, but there are clinical trials that suggest that strength training can also be beneficial to your cognition and your thinking abilities, and growing research that what we call mind-body exercise, and that can be things like Tai Chi, even dances sometimes included in there, and of course, that's a rich intervention or a program in of itself are beneficial. We get what we see on an MRI and what we can see in cognitive tests. There's not as much evidence, but there's still growing evidence that those are also beneficial to you in line with what we might recommend for broader health implications.

(23:23):

One thing I'd like to point out when talking about modifiable risk factors is that physical activity really has influence over many of them. We know physical activity can reduce the risk of depression and improve mood, and that's a risk factor for dementia. We know that physical activity can improve your sleep quality, another risk factor for dementia. Helps regulate your blood pressure, helps regulate your blood sugars, so you're less likely to get diabetes. It can help in weight management along with healthy eating. It can also be an opportunity for social engagement and learning.

(23:58):

So we treat it as it's one element, but it does expand out to influence all these other risk factors for dementia as well.

Dr Carmela Tartaglia (24:07):

It'll be different for different people. Different people have different backgrounds. I think things like dancing are great because they kind of combine the learning aspect as well as the physical activity. And there's a lot of evidence for environmental enrichment in addition to physical activity. So there's a lot of room for us to grow and to learn new ways of modifying.

Heather (24:31):

I know a lot of your research focuses on biomarkers and other ways of looking at early diagnosis that will lead to earlier intervention. So is this a time when if all of those things sort of come together, then we could actually finally see some momentum in this area, hopefully for the patients that are living with it?

Dr Carmela Tartaglia (24:50):

Exactly. People come to you and they have a change. They feel something. And if you could tell them, "Listen, this is going on right now, even though you're doing very well," it is very motivating for people. And so biomarkers will change this landscape because a lot of times when you're talking in abstract

terms, people think, well, maybe it's not going to happen to me. But if we tell them, "No, it actually will because this is already going on, and you have the power in you to actually change the start date of this disease and the way you're going to journey through," I think we can get a lot more engagement.

Heather (25:32):

If we have viewers who are listening today who are in their 20s, in their 30s, even teenagers, what do they need to know and take away from this conversation today to change their lifestyle in a way that can actually have an impact and hopefully reduce their chances of dementia and other neurological diseases?

Dr Carmela Tartaglia (25:51):

I always stress upon people, because I do see people of all ages, is that you only have one brain. When we died young, it was okay to abuse ourselves, but our lifespan now is into our 80s and there are a lot of people living into their 100s, and if you don't take care of your house or your car for a long period of time, you will live in a shack and drive a rust bucket. So the same thing for your brain, for your body. We cannot be lackadaisical about our brain health, our body health anymore, because our lifespans now are too long.

Dr Laura Middleton (26:28):

Yeah, and I would add behavior change isn't easy. Our jobs are often very demanding. They're often sitting still at a desk. Social media, of course, out there. And so we need to build a system that supports us. When I think about behavior change, I often present it as two choices that you can think about it.

(26:53):

The first one is the brush your teeth scenario. I get this from a neurologist, who you likely know out of Sunnybrook, called Rick Swartz. I remember talking to him, and he said, "The dentists have won, and we have lost." He said, "Everyone brushes their teeth twice a day pretty much regardless, because otherwise they feel dirty. Yet people should feel the same way about eating healthy, being active, getting out and seeing people, and they don't."

(27:24):

So at minimum, try to set something you do every day. Even if it's 10 minutes that you do every day, then that's a start, and try to integrate it as part of your routine. Can even do it while you're brushing your teeth, right? Do some squats while you're brushing your teeth. Do some balance exercises.

Heather (27:42):

Good idea.

Dr Laura Middleton (27:43):

And then there's the other if you do something you love, it won't feel like work. I think there's evidence aerobic exercise... but aerobic exercise isn't everything, so find one you like. It can be as simple as walking. It can be jogging. It can be swimming. It can be biking. It can be dancing. Find something you like, do it with someone whose company you enjoy, and that will help support your behavior change, because having someone to support you is really important. This is something you look forward to, that in the moment pleasure you get from it, you're way more likely to stick with it. And not all exercise has to be on a treadmill and at a gym. That's not that fun for most people. Let's find a way that brings joy as well.

Heather (28:23):

Well, speaking of that, I know that you're a rower.

Dr Laura Middleton (28:26):

That's right. I think of it like we talked about dancing earlier. It's high intensity aerobic exercise, but I'm doing it with other people. I'm thinking about how to improve the skills. So I always think of it as everything in one. I love it. I love being on the water.

Heather (28:44):

Dr. Tartaglia, what about you? What are some of your favorite ways to keep fit?

Dr Carmela Tartaglia (28:48):

I love running. It's easy. I can bring my running shoes anywhere. I particularly like that.

(28:53):

I just wanted to add to Laura's comment. I'm not as nice as Laura. I always tell my patients it's like, "You know what? You give me one hour of your day and the rest of the time you can do whatever you like, but don't think about liking it. I want you to do it like it's a medicine." And just like nobody likes taking pills, but we do it because we think it's good for us. Who wants to take antihypertensive medication every day or a diabetes medication every day, but you do it because you think, "Yeah, this is helping me."

Dr Laura Middleton (29:24):

That's the brush your teeth approach.

Heather (29:26):

Yeah, whatever works.

Dr Carmela Tartaglia (29:29):

Yeah, because the thing is that it is as valuable, like you said, as brushing your teeth, right? This can change your future.

(29:39):

And so I agree they should try to find something that they love to do because I do agree that it's so much easier, but it's hard because sometimes we're dealing with people who really have never envisioned themselves doing exercise like after that high school gym class.

Heather (29:57):

That's it. They gave up.

Dr Laura Middleton (30:00):

And I do think that taking that first step, it's really hard. Rarely is that going to be the pleasurable part. You need to get going, and you need to get the month or two into it, and that's going to be a push, and that's going to be just because you know have to do it. Then you start feeling the rewards. And then, hopefully, maybe you get to know someone who's at the gym at the same time as you, and you have that connection. And you start feeling stronger. You notice you can walk more easily. You're not

breathing as hard going up and down. You might not immediately notice all the cognitive effects, the mood effects that you're talking about, but you start to feel better, and it starts to be a routine. And you have people giving you feedback often that you're looking and feeling better, and then you get that reinforcement.

(30:47):

Certainly in the first month, maybe slightly longer, it just requires a dedication to making that change and finding what works for you, but hopefully in the long run, you start to feel those benefits, and that motivates you. Because I do think many people have a bad experience in high school gym class, and then they think it's not for them, and being active is not a high school gym class.

Heather (31:08):

Laura, I know that you have a lot of resources to share, which we are going to put on our website both for those who are working with people with dementia and also for those with lived experience and their caregivers too. So all of that information we're going to link to on our website.

(31:23):

I just have one last question for both of you, and it's really on a personal level. I guess I'm just curious what motivates you both and why you're so passionate about this? Because I know that most days working in the field of dementia and Alzheimer's can't be easy. So what motivates you to keep going? Dr. Middleton?

Dr Laura Middleton (31:41):

Well, I got into this area because my aunt was diagnosed with early onset Alzheimer's disease. She was diagnosed at 46. My cousins were at 12, 14, and 16 when my aunt was diagnosed, so it had a tremendous impact on our family. She was my mom's best friend. It was a big deal. And so that's my foundational motivation to all of this.

(32:04):

But I will add that over the last 15 years, I've met so many people with dementia and their family members, and incredible people. Whether it's a person who's in a really challenging situation and seeing what they're struggling against, or people who have managed to live really well with dementia and hearing what they need, that's an incredible motivator, and also a really rewarding piece of my job. I'd say actually getting the opportunity to engage with people with dementia and care partners and listen to them, learn from them and try to start supporting them more is incredibly rewarding, and sure, challenging. But rewarding more often.

Dr Carmela Tartaglia (32:44):

I feel completely privileged to be able to be part of these journeys through these diseases. I love people and their stories, and actually that's what dementia care and cognitive impairment care is about, because when your brain changes, you fundamentally change. And so people come to me with their life stories, and a lot of times people want us to know what the person was like before I met them. They were an artist. They were a mother. They were a hard worker. And I get to see that. It's not just the person in front of me. This person has a history.

(33:23):

So I feel completely privileged and anything I can do to help them traverse this period that will improve their quality of life, I am happy to do and want to be part of the solution.

Heather (33:40):

Thank you both for joining me today. I think it's a really important episode for people to listen to and really to understand that they do have some control over their health, and they should take advantage of that. So thank you both.

Dr Carmela Tartaglia (33:52):

Thank you.

Dr Laura Middleton (33:52):

Thank you.

Heather (34:00):

Thanks so much to Maria Martinez, Dr. Carmela Tartaglia, and Dr. Laura Middleton for joining me on the podcast today.

(34:11):

This episode of Your Complex Brain was produced by Jessica Schmidt. Dr. Amy Ma is our executive producer. Thanks also to Kim Perry, Meagan Anderi, Sara Yuan, Liz Chapman, and Lorna Gilfedder for their production assistance.

(34:32):

For more information about the Krembil Brain Institute, please visit uhn.ca/krembil. And you could reach us by email; krembil@uhn.ca. If you enjoyed this episode of Your Complex Brain, please tell your family and friends, and don't forget to leave a rating and review on your favorite podcast listening app.

(34:54):

We'll be back in two weeks with another exciting episode. Have a great day.