

Heather 0:00

[Your Complex Brain theme music] 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. 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 also empower you with the latest research to help you take charge of your own health. You'll hear directly 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. [theme music continues then fades out]

[gentle electronic music] Today on the podcast, we are going to be talking about the top-five scientific, evidence-based ways to keep your brain fit and healthy, and we have loads of expert advice coming your way from our amazing UHN scientists and clinicians. But, we also thought it might be fun today to tap into the expertise of our Your Complex Brain podcast team—yay!—who are always busy behind the scenes doing their actual jobs and helping to produce this podcast because it's just too much fun putting these episodes together for you. Right, Jess? [music fades out]

Jess Schmidt 01:36

Correct.

Heather 01:37

Jess is our brilliant producer and editor. Jess, why don't you introduce yourself and tell us a little bit more about what you do?

Jess Schmidt 1:44

I am Jess Schmidt. I run the records, I do all of our editing, I get to put in all the fun sound effects and the music on the show, and every episode has to come through me to get assembled before it goes back to the team to make sure that I did a good job. So, that's mostly what I do at Your Complex Brain.

Carly McPherson 02:05

Jess always does a good job.

Jess Schmidt 02:06

[chuckling] Thanks, Carly. I try.

Heather 2:06

Speaking of Carly, Carly is our executive producer. Carly, what do you do as executive producer, and what is your actual job here at Krembil?

Carly McPherson 2:15

Mm, thanks, Heather. So, my job here at Krembil, I'm a senior manager of Research Institute Business at the Krembil Research Institute and, as you mentioned, I'm also executive producer of Your Complex Brain, and I have been for the last two seasons. So, my role in this podcast, it really ranges from the very beginning with the content lineup, ensuring that we're aligning with representation of our basic translational and clinical research programs, and we do have an added focus of diversity, not only from an EDI perspective, but also the perspective of some of the different roles within our research and our patient care areas. I do this primarily with Heather and then we broaden the content lineup to the rest of the group for their input and contributions. And then, I have involvement with the records so I'm on

almost all of them. And then, my contributions are also on the editing side and right up until when we launch. Once we launch. I also contribute to the marketing of the episode and run all of the stats. So, that's a little bit of what I do.

Heather 03:23
That sounds like a lot.

Carly McPherson 03:25
[laughs] It's a lot, but it's fun. It's very rewarding.

Heather 03:29
You forgot one really important part of your job.

Carly McPherson 03:31
What's that?

Heather 03:31
Reining me in and keeping me in line.

Carly McPherson 03:33
Ah. [laughs]

Heather 03:34
So, thank you for that.

Carly McPherson 03:36
It's not that hard. [laughs] It's very enjoyable, Heather, always. Always.

Heather 3:39
Dr. Amy Ma. Let's have you weigh in.

Amy Ma 3:42
Hi, I'm Amy. I am another senior manager of Research Institute Business at the Krembil. I contribute to this podcast, mostly in the context of editing. I also listen in on the records themselves and provide feedback anywhere from asking our guests and hosts to define acronyms for the lay audience, to things like trying to rerecord with different intonations and speed in voiceovers.

Heather 04:12
We like to call Amy quality control.

Carly McPherson 04:14
Amy is the quality control, and then not to mention the fact that you have a PhD in science, so you're able to help us, you know, break down some of those language barriers as well, which I think is incredibly important for our general audience.

Heather 4:26
Absolutely.

Amy 4:27

Thank you. One of the reasons why I am involved with this is because of the incredible people that are involved with this project. My daytime job is a full-time job and sometimes it's difficult to find time to do extra projects, but when you have a great team of people, a great project, you find the time to do it. So, here I am.

Heather 4:46

She's talking about you, Twayne. You're up next.

Twayne Pereira 4:49

So, I'm Twayne. I work at Krembil as a senior public affairs associate, and my involvement in the podcast involves all the content to promote the podcast on our social channels, across UHN, and to really help get the word out there. So, that's my main focus. I also do provide some help with editing and the content in that regard. It's really fun to share the stories and share the content of the scientists, their work, and then also the patients' lives who have been affected positively because of the research that we do at the Krembil Brain Institute. And then, my day job is I also create content for the rest of the Institute, [chuckles] pretty much, so anything that has to do with photo, video, graphic design.

Heather 5:32

[light, bubbly electronic music] Okay, so you guys, on top of all that you do in your day jobs, which I know is a lot, what in the world would motivate you to take on being part of this podcast? Carly, you want to start?

Carly McPherson 5:42

Sure. What motivated me initially to get into research and then continue to advocate for research is I have a family member who passed with Alzheimer's disease. And so, for me, in the time that I've spent here at UHN and at Krembil Research Institute, I've just learned so much information that all I want to do is translate this to the public. And so, I think that knowledge is power, and the more evidence-based information that we can offer individuals in an accessible manner, the better, so that they can make informed decisions and choices or maybe just modify different lifestyle factors. And, as a motto that I know that we have in our office and this whole team here, is we really just believe in making science accessible for everyone, so that's what motivates me to be part of this project, and I love it.

Heather 6:26

And, Amy, I know that you always love when we get great feedback from some of the people that we interview and some of our listeners, as well. Is that when mainly motivates you to want to be part of this project?

Amy Ma 6:35

That definitely is in part, one of the reasons. Another reason is that I want to be a part of something that matters, that has an impact, not just within the lab, which is where my background is, but how does lab work or the work inside a research institute, how does that go outside of those four walls, and go beyond and actually have impact? And, I want to be a part of something that actually has impact, and that's why I'm here.

Heather 6:59

Twayne?

Twayne Pereira. 7:00

I mean, I enjoy scientific communication. Having a science background myself, I knew that when I was in school, like, I tried to talk to my parents about this stuff, and it didn't really click with them. [music fades out] They're like, "What does that mean? So, what are you really doing? Are you a doctor yet?" [all laugh] Yeah, so it was a lot of that kind of stuff and I kind of found my intersection with the creative sort of mediums of photography, graphic design, in my university and I was like, "Well, this is a great opportunity for me to kind of pair the two and use my greatest side to pair it with my scientific side and really help translate all the cool research that's going on". And, it's really, really fun because, when someone that you're talking to understands the research that's going on at our Institute, they're like, "Whoa, I didn't know that was happening right here in Toronto," and you get that kind of feedback, it just feels great.

Amy Ma 7:51

I have a question for you, Heather. You come from a background of journalism. What motivated you to join the Krembil Brain Institute and also to spearhead podcasts all around neurological diseases?

Heather 08:05

Wow, look at Amy turning the tables on me.

Carly McPherson 08:10

Yeah, well done.

Heather 8:10

You know what? I think back to actually my initial interview. I remember getting a very similar question and actually, thinking about it on the spot, it much aligned to what Carly was saying. I started thinking about all of the family members and friends and people in my circle who've been impacted by brain diseases – by stroke, by brain cancer, by Alzheimer's, and I thought, "You know, all of us, in a little part, are Krembil stories". [light, pulsing electronic music] And so, I think that was a large part of me wanting to come to the Krembil Brain Institute. This podcast was something that I pitched in that initial interview, and it took a few years to sort of launch off the ground, but it has been an experiment that has paid off in spades, I think, in terms of the reaction and the feedback that we get and with our goal being just that we want people to know what's happening within our Institute. We want people to meet the scientists and clinicians that we work with, who, you know, just are so dedicated and so amazing at what they do. So, I think that's just a big part of it. Also, as you all know, I love talking to people and I just love, love, love the editorial part of the job, but I'm now going to turn the tables on Jess, because she also didn't come from a scientific background, but she joined us here to take part in this project. What do you get out of it, Jess?

Jess Schmidt 9:20

I love science. I am, first and foremost, a podcast lover. [chuckling] I don't think anybody on this team is surprised to hear me say that. [Carly laughs] That's what I do all day, every day, is I make and listen to podcasts, and I love it. But, what drew me specifically to this show, to Your Complex Brain, I didn't know that this is the direction we were going to end up going but one of my favourite things about this show is that I happen to be in the demographic that this show is designed for, and that doesn't happen a lot. I'm not usually the demographic for the shows that I'm making. I didn't know I was going to love learning about my own brain so much, but I do. It's fascinating. It's such a good show. It's such a privilege to get to hear it before it gets into people's ears, and then to be able to help deliver it to people is just amazing. But, the more we find out, especially about the brain health of young women and how much

support is lacking for young women, I think that it's just so important to be able to offer that support and also, like, disseminate the research that's happening because, you know, the scientific community is realizing that there is a gap in this field, in this demographic, and they are making really good strides to help fix that. Like things like stroke in women under 50, there's so much more research on that and we've done a number of interviews where that comes up. It's just so special to work on a podcast that is for me – [laughs], not that that was the intention, but it just feels really amazing and special.

Heather 10:54

That's a good point too. A lot of what we do is wanting to empower people about their own brain health. We don't only want to tell you about the research; we want to tell you what you can do to keep your own brain healthy and active. So, I know that our listeners can't see all of you, but I can attest that you are all beautiful, fit, vibrant, vivacious, amazing people.

Carly McPherson. 11:17

Well said. [Heather laughs]

Heather 11:20

[upbeat electronic music] I just want to know what you each do to keep your own brain fit and healthy before we launch into today's episode. Twayne, you want to star? It's going to make the rest of us look bad. [Carly laughs]

Twayne Pereira 11:28

Oh, man. I don't know. My wife and my parents will say I do too much. I don't stay at home very often, I guess, because I'm always [chuckling] keeping myself busy. Well, I guess I'd say there are two big things that I do to keep myself mentally well. One is just try to be creative and that really kind of falls into my photography and my love of photography, and even though I do create content and do photography for the job at Krembil, I also do my own work outside of that job that's sort of very different than what I do in sort of the 9-to-5 world. But, the other thing I would say that I do is I work out, like, a lot. [laughs]

Heather 12:07

Mm-hmm. Like, a lot. [all laugh]

Twayne Pereira 12:06

So, a lot – like, five to six days a week and it's fun because, I mean, the gym that I go to is a community. You have structured classes and you get to know the people in these classes, and it's not like you're ever working out alone. The way that I like to work out is with people and, usually, you're encouraging one another and, you know, you're building friendships outside that gym, so I guess the physical activity aspect of that, and then also, I guess the social aspect of that, kind of helps me stay well.

Heather 12:33

And, we learned, in episode one of season two, how important social interaction is, so you're way ahead of the game. Amy, what about you?

Amy Ma 12:39

I would echo what Twayne said, to have those social interactions, but also to ensure that you're surrounding yourself with the right people who can motivate you, who can help you de-stress in times of stress, such as those who are on the call right now with me.

Heather 12:56

Aw.

Amy Ma 12:56

I do dabble in some exercises, also because influenced by the right people—namely, Carly—so, I don't go six or seven times a week, but I think it does help. Overall, also to get enough rest, this is something that I feel is very important and, when I don't get that regular rest, I immediately feel the effects of it, whether, you know, I can't think properly, I cannot focus. And also, to listen to your body. If you need to walk away from something, you walk away from something. I really enjoy gardening and, right now, this is the season, so that's really perfect for me. So, whenever I'm in a situation where I feel stressed, or I can't think, or I just need to step away, go outside, take a breather, and then it's like a reset.

Heather 13:39

Not to mention your artistic side, your jewellery making, your craftiness. That all adds in.

Amy Ma 13:46

Yeah, absolutely.

Heather 13:47

That's right. When Amy doesn't get enough rest, we all feel the effects of that, [Jess laughs] so we definitely need you to get some rest, Amy. [Amy laughs] Okay, let's see how Jess can top that. Jess, what do you do to keep your brain fit and healthy?

Jess Schmidt 13:58

One of the things that I do, which is very begrudging, is I play chess, and it's begrudging because I play against my partner who is a much better chess player than me. So, usually, I play online against people who are more in my skill level because, that way, it doesn't cause any marital strife. [all laugh]

Heather 14:21

Smart.

Jess Schmidt 14:22

There's a lot of cognitive work that goes into playing chess, like you have to have a really good memory, you have to have a really good sense of how to plan moves ahead, you have to have really good problem-solving skills, and those are all things that actually, if you keep on working on those things throughout your life, it will help you combat things like Alzheimer's, dementia, cognitive problems that you can run into down the line. Like, really, your brain is a muscle, and you have to work out your brain. Just like Twayne was saying, like, your body is full of muscles, you have to work out your body to support your brain, but your brain, itself, also needs to get workouts, so how to do that is through chess. And, I actually do have another podcast that I work on, again with my partner. He is my chess expert on the show. That is like maybe less serious [chuckles] than Your Complex Brain because it's mostly about a scandal, in particular, that happened in chess last year, but we also kind of get into, like, the psychology of chess and, like, the cognitive things that chess can do for your brain, so maybe there'll be a crossover with Rooked and Your Complex Brain down the line. Who knows?

Carly McPherson 15:26

[chuckles] For me, I really look at brain health as, you know, a holistic approach. I think, also, reflecting back on all of the episodes we've had throughout our past two seasons, there have been a lot of tidbits

and takeaways for myself, or the evidence of physical health being so important that, you know, exercise and diet can really impact the brain, I really try and plan my week or my day to include things like hydration, you know, consuming enough water throughout the day, "How am I doing? Have I had too much caffeine? Is it noon, and have I not, you know, taken a sip of water yet?" I'm also having that movement.

And then, like Amy, you know, sleep has become a really big thing for me, so at minimum, I make sure that I'm getting seven hours every night and I find that to be extremely helpful on a number of levels. Speaking of diet, I do have two children and a wonderful husband who does almost all of the cooking — bless him—but we really focus on not having, you know, too much of those processed foods, having a really colourful and balanced diet. That's really a priority for us. And then, I'm also really cognizant of my own mental health, those boundaries and managing stress – that's really important. And, over the past few years, just with what everyone has gone through as a collective, it's becoming more and more prominent that we need to really set time for ourselves and not live to work. So, I think that that's so key, and just really maintaining my own social connection, so meeting with all of you each and every week is amazing. I make sure that I'm connecting with family and friends and making that a priority because, you know, we've spoken, even in the Alzheimer's episodes, about social isolation being a risk factor, and so I think that, in the time frame that we're in now in our lives, it's really important to solidify those connections and make sure that they're long-lasting, so that we have those later in life. It's really all about setting, you know, appropriate habits now, setting up good strategies for later in life, and making sure that we're at our healthiest now, so that, you know, when we're 60, and 70, and 80, and hopefully 90, all of this can really translate and we can be really strong and very cognitively capable, which leads me, I think, to my last thing, and it's focusing on just the brain health itself, and really looking at those modifiable factors because, you know, there are so many things that can happen in life. Genetic factors that were previously unknown can really change the direction in our lives, and I'm going to do whatever I can with my modifiable risk factors to set myself up for future success. There's more evidence, actually, to learn that being bilingual or picking up a new language can actually strengthen your brain function, and so I have been beginning to dabble into my earlier years where I was taking some French, and I'm more motivated now, more than ever, based on the literature and the science that we're being faced with, that that's something that can really be beneficial, so...

Heather 18:51

Yeah, and if there's a trip to Paris, at the end of all of it, I mean, so be it. [Jess laughs]

Carley McPherson 18:59

It's true, it's true. [Carley laughs]

Heather 19:01

Well, I think much of what we all talked about today is really a lot of what we're going to be discussing with our experts, coming up, about the top ways that you can keep your brain healthy and fit. And, like you say, Carly, so much of it has to do, not necessarily with waiting until, you know, you're in your later years, but things that you can do in your younger years to really set yourself up for success in terms of keeping your brain healthy.

Jess Schmidt 19:16

Heather, what do you do to keep your brain healthy?

Heather 19:20

Oh, my gosh, [laughs] because there's so many things I want to do to keep my brain healthy, and I am a work in progress. But, if I had to think about it, I think the most important thing I've done is get two dogs and, because of that, we spend the majority of our lives, in addition to our kids—but we only talk about our dogs [all laugh]—we spend the majority of our lives trying to entertain them and take them new places, and what this results in is, you know, seeing new things and going to new parks and on nature walks and hikes, and I really find that being out in nature, for me, personally, is something that really, really helps me de-stress. It helps everything about the way that I think. It motivates me. So, I really want to try to do that as much as possible.

And then, the other thing that I've been thinking about, along the lines of learning a new hobby—although I really should think about a new language so I can go somewhere cool—is taking up guitar. I used to play guitar when I was really, really young, and then I got grooves in my fingers and I was like, "Ugh, forget that." [Jess laughs] So, I think I might take up guitar again. That's my plan.

Jess Schmidt 20:21
That does sound fun.

Heather 20:22
Anyway, I want to thank you all for everything that you guys do for Your Complex Brain, and I just love working with y'all, as Jess would say. [all laugh] And, on to today's episode. [music continues then fades out]

Tip number one, [electronic chime] eat healthy. [light electronic music] It may seem like common sense, but eating the right kinds of foods, while avoiding others, can actually help fuel your brain in addition to your body. Dr. Andrea Furlan is a senior scientist at the KITE Research Institute, a physician at the Toronto Rehabilitation Institute, and the author of the newly-released book, *Eight Steps to Conquer Chronic Pain*. Here she is with more on the crucial connection between good nutrition and brain health. [music fades out]

Dr. Andrea Furlan 21:18
[gentle electronic music] Good nutrition is so important because our brain needs the nutrients to make the neurotransmitters. Basically, without the right amino acids, the brain cannot make the serotonin, dopamine, endorphins, cannabinoids that our brain produces. That's our inner pharmacy. Without the right fuel, which is sugar, coming from the right carbohydrates, our brain does not have the energy that it needs to function. Even though the brain is one of the smallest organs of the body—it's only 2% of our body weight—it consumes 20% of all the energy that we consume. So, all the calories that you consume every day, even if you're not awake—your brain never rests—even when you are sleeping, it is controlling all the body functions; your heart continues beating, you continue breathing, your digestive systems are still working, and that's all controlled by the brain. [music fades out]

We need to treat our brain really well and we need to give it the nutrients that it needs to function. So, good nutrition is not a rocket science. You don't need to read 1,000 books and be complicated. It's simple. It's basically a variety of nutrients, including proteins, carbohydrates, vegetables, fruits, fibres, essential amino acids, essential fats. If you look at your plate and it doesn't have processed food and it's very colourful and it contains one third is protein, one third are carbohydrates, one third is fat and fibres and minerals, then you're doing okay.

Fat is another big, big topic. People say, "Fat is good". "No, fat is bad." "Oh, let's just eat fat." "No, let's remove all fat." I believe, and there is a lot of science backing this, that fat is necessary. First of all, our brain is made up of fat. There is one type of fat that is called the PUFA – the polyunsaturated fatty acids. They are substances. They are called omega 3s and omega 6. So, where do you find omega 3s, because omega 3s are excellent for the brain health? Omega 3s are involved in preventing or delaying the development of dementia like Alzheimer's and those things, so they are really important. So, fish is an excellent source of omega 3s – cold water fish. We're talking about salmon, trout, mackerels, herring, sardines, cod. [laughs] I love all of them. I could just eat fish all day, every day of the week. The other source of omega 3s are also some oils, for example, canola oil and nuts too.

[light electronic music] So, we also know that refined sugars, they are not good. They are not healthy. You don't find them in nature. The problem with refined sugars is that they are addictive. Ice cream has a lot of sugar. Those muffins, cupcakes, donuts that we love, the problem with those sugars is that they are also damaging for the brain. We know that the brain development needs fuel, but if you are loading the brain with refined sugars, the white sugar will provoke the brain to create some deposits of substances in the brain that will block the normal function of the brain. [music fades out] You know, if you eat, like, a chocolate cake once or twice a year when there is a birthday celebration, it's not a problem, but if you eat sugars – you know, cakes, donuts, muffins, or pops that have a lot of sugar in them, the soft drinks, and the juices and the cereals – if you eat constantly, throughout your life, you're going to create those deposits of substances in the brain that, one day or another, they will be impairing the function. I was reading about this in scientific studies, and it's scary because a person that eats mainly a lot of refined sugars, their brain is older 18, 19, 20 years, compared to someone that didn't eat those sugars many years of their life, which is scary because that is what predisposes people to have dementia, cognitive impairment, Alzheimer's, but not only this, a lot of other neurodegenerative diseases that cause problems of balance, memory concentration.

So, if you really want to have your brain sharp when you are getting older, paying attention to nutrition is extremely important. It's not just important to live longer, but to live with your brain, with your mind fully functioning, so then you can enjoy those last years of your life. A lot of my patients, they ask about which diet I recommend, and there are so many names: Mediterranean, paleo, keto, anti-inflammatory. I tell them, "Try to choose a diet that is healthy, low in processed food, that has a variety of nutrients and food, and don't limit yourself to only one food group." [rhythmic electronic music] I don't prescribe a specific diet. The anti-inflammatory and Mediterranean diet, they are the ones that I'm most familiar with. That's the one that I eat in my home. That's the one that my mother taught me and the one that I'm teaching my children. Some changes that you can make today, eliminate all refined sugars and drink water, tea, fruit juice; they are very healthy. Eliminate all processed foods. Then, you're also eliminating those refined sugars. So, if you're thinking about making a change to your diet, it's never too late. If you have not been eating healthy up to this point, change now. Nutrition is so important for your sleep, for pain, for brain health, for your guts, for your concentration, for everything. [music fades out]

Heather 28:05

Tip number two, [electronic chime] be social. Research shows that interacting with friends, family, even strangers, can boost attention and memory, bolster your brain's neural pathways, and help to prevent cognitive decline. [upbeat electronic music] One interesting study from Florida State University showed that, when people are lonely, they have a 40% increased risk of dementia. We asked Dr. Jaideep Bains, Director of the Krembil Research Institute and Senior Scientist at the Krembil Brain Institute, about the science around social isolation and your brain. [music fades out]

Dr. Jaideep Bains 28:46

[cheerful electronic music] There are many health benefits to being social. You know, over the last decade or so, we've discovered that loneliness or the absence of social interactions really has a huge impact, not only on quality of life, but it turns out, also on lifespan. There is an emerging literature on the importance of social interactions and sociability. There's a really strong understanding that we, as human beings, are social creatures. Our brains are wired to be social. It's a big part of contributing to our wellbeing in general – not only our mental wellbeing, but also our physical wellbeing.

You know, one of the things we learned during the pandemic is that we really crave these social interactions, and I think that idea of craving social interactions builds on another theme in social neuroscience, and that is that social need is like a basic biological need, just like hunger is a physiological need. There is this emerging idea that social interaction is a homeostatic, or basic fundamental need for us. One of the things that we study is stress and how stress is transmitted to others and how, through social interactions, the benefits of stress can be buffered. [music fades out]

So, one of the ideas in neuroscience and evolutionary biology is that social interactions initially emerged because of benefit provided through transmitting information to others, and that information was largely information about threat danger or a negative emotional state. By transmitting that information, externally, to others, that allowed an individual to gain some protection or a buffer against these negative experiences – a stress, a threat, a predator. So, that was probably the building block of social interaction.

But, what also emerged through evolution and one thing that we recognize is that social interactions also provide—for lack of a better term—a good. Right? A greater good. So, interacting with others when you're in a negative emotional or stressed state, it can be quite beneficial. So, the effects of stress can be mitigated or relieved through social interactions, and this is really, you know, one of the building blocks for concepts like empathy that we think a lot about.

[gentle electronic music] We live in these kind of isolated bubbles often, and we've taken most of our social interaction out of the physical world and moved it to an online world, which is very, very interesting. And so, the type of social interaction that we get through online interactions is very different than the type of social interaction that we experience in the real world, because the real-world social interaction is not just explicit communication, words, and things like that, but it's also a lot of implicit cues that we pick up about individuals, and all of that helps kind of tune our brain in a slightly different way than social interactions online.

And so, I think social isolation is the absence of interactions with others. Sometimes, social isolation can be something that you make a decision to pull yourself away, and that's fine. Loneliness is more of that craving or that desire, that almost intense need that you feel when you are isolated from others. It is that kind of almost negative internal state that is created when you are lacking positive social interactions. Positive social interactions recruit a lot of the circuits in our brain that are linked to reward, for example, dopaminergic systems that people will be familiar with, opioid systems, and also things like oxytocin, which is a nurturing maternal hormone, so there's increases in the activity of neurons in the brain to make oxytocin, for example. And so, there's all these links between these molecules or these chemicals that have been linked with positive feelings, with rewarding feelings, and these chemicals are going to be released in response to social interaction.

And so, I think one of the things that we're beginning to understand is that positive social interactions seem to leverage the same circuitry that other types of rewarding stimuli do. [music fades out] A lot of people are introverts, and so there's this kind of range of social comfort that we all have, and I think that telling introverts that they need to go out and socialize is probably not the best thing, and I think it speaks to this idea that we all have a different setting on our social homeostat, and so you have to find that setting that works for you. Some people are very gregarious and outgoing and social, and you need to interact with 40 people a day. If that's where your social homeostat is, that's what you should go and do. There are others who are completely comfortable interacting with one or two people. If that's where your social homeostat is set, that's what you should do. I wouldn't say to everybody, [chuckling lightly] you know, "Go out and socialize and mingle," because that's just not comfortable for a lot of people, but I would say, "Think about and maybe a little bit introspective on where you are on your social homeostat and see if it fits with your personality and where you have been in the past". We are beginning to understand that we can affect our mental health in a positive way through strong, positive social interactions, and I think it is really a case of being able to change your internal state and tune some of the circuits in your brain in a good way through positive social interaction. [music fades out]

Heather 34:34

Tip number three, [electronic chime] get some sleep. I know... [upbeat electronic music] Easier said than done, right? But, the latest science shows that good sleep hygiene is crucial to keeping your brain fit and healthy, especially as you age, and there are simple changes you can make today that will benefit your brain in the long term. Dr. Mary Pat McAndrews is a senior scientist at the Krembil Brain Institute and Head of the division of Clinical and Computational Neuroscience at UHN. Let's listen in to see what she has to say.

Dr. Mary Pat McAndrews 35:11

[crossfades to relaxing electronic music] You really need sleep for a number of reasons, but particularly to protect our brain health. There's two major things that happen in your brain during a good sleep. One is kind of a housekeeping activity. During the daytime, we build up lots of connections between cells, called synapses, and we have toxins and waste products that we build up because we're burning lots of energy in our brains. And, actually, during sleep is a time where that is cleaned up a little bit, so we can actually have a particular system in the brain called the glymphatic system that operates primarily during sleep, and it actually helps to clean out those toxins. So, there's a lot of housekeeping that's important there.

And, the second reason is that there's very particular ways in which certain aspects of sleep actually help our memories. So, during sleep, evidence has shown that, actually, we can replay certain memories of things that have happened during the daytime, and that really helps to consolidate these memories. And, there's also very good evidence showing that the amount of time that you spend in particular aspects of sleep, called slow wave sleep, is actually a great promoter of this consolidation of memory.

The sleep night is divided into different phases, and the one that most people think about is REM, or rapid eye movement sleep, and that's basically when we're dreaming, and our brains are quite active. But in fact, there are other phases of sleep called non-REM sleep, and those phases—one through four—are basically times when the brain is getting quieter, so the activity is actually slowing down, and it's during this slow wave period of sleep where we find that housekeeping activity, as well as that memory consolidation. So, the REM sleep may play an important role in our dreaming and our ability to kind of work through our daily hang ups and dream away our problems, but there's really a lot of activity going on during this characteristic slow period of sleep, as well.

When we don't get enough sleep, everybody knows you feel crankier the next day, so that is the one thing that is a universal finding, and anybody can deal with that on a kind of one-off basis, right? We can all kind of accumulate what we call a sleep debt, and hope that we'll be able to kind of make up our time during the weekend, for example. But, if it becomes a chronic problem, it actually has, first of all, an effect on lots of body organs.

So, chronic sleep deprivation increases your risk of high blood pressure, diabetes, depression, cardiovascular disease, so it's really kind of bad for all of your organs, but it's also pretty bad for your brain, as well. I want to kind of put this in the context of some newer research that's actually looking at the relationship between sleep and dementia. There are some new studies that have come out where they've been able to look at individuals over a long period of time, something like, you know, six to 25 years, and sometimes what they do is to look at people's records, their self-report of their sleep, and sometimes they actually have different devices that can help measure sleep, either electrodes on the head, or what we call actigraphy, which are those smartwatches that everybody has that tells them how much they're sleeping at night, right? But then, they can look at it, long term, and say, "Well, what's the effect of poor sleep on a chronic basis in terms of your relative risk for dementia?" [music fades out] And, one recent study actually showed that, if you get chronically less than seven hours of sleep in your fifties and sixties, that that's related with a relatively moderate increase in risk of dementia.

[upbeat electronic music] What's happening here? There's some really nice scientific evidence that shows that some of the kinds of bad proteins that we associate with dementia, things like beta amyloid or tau—these are the kinds of characteristic bad actors in Alzheimer's disease, but tau, also, in some other dementias—have actually shown that, again, poor sleep is related to a greater accumulation of that in the brain. So, these bad, misfolded proteins that could be causing dementia, sleep seems to be playing an independent role in that. And, you might say, "Well, how the heck does that happen?" and part of it might be this glymphatic system. Remember that system that's supposed to be cleaning out all those toxins, and all those, you know, things that have accumulated over the day? And, maybe it's an important way in which, if you're not getting the sleep that you need to get, this glymphatic system can't work at the same level. And so, now, you get an accumulation of these proteins that can't be whisked away.

And so, that's one possibility, and another possibility that we've also been looking at more recently, even in my lab, is that we know that there's a newer relationship between what we might call these spiking activities in the brain, especially in the areas that are important for memory, and these are often found in people with epilepsy, but we can also start seeing them in people with very early stages of Alzheimer's disease, or maybe even before you start showing clinical symptoms. And, it turns out that the spiking activities are more likely to be accumulating during certain periods of sleep, and so there may be this kind of awful cascade where, you know, disrupted sleep adds to more spiking activities, more spiking activities means you get more accumulation of these bad proteins, and on and on, and it's just a vicious cycle.

So, it's relatively new evidence, trying to link all of these things together, but there really is a fairly strong relationship now, we begin to believe, between good sleep health, and the likelihood that you'll maintain good brain health in your later years. There are a number of different kinds of best practices that have been recognized for good sleep hygiene. One of them is to kind of stick to a schedule to get your body kind of entrained with the idea that you're going to sleep on a regular basis. You should make sure that the environment that you're in, in your bedroom, is a restful one. [music fades out] No

listening to the news as you're falling asleep, no picking up your smartphone. This should really be the time where you say, "Let's turn all that off and let's make an opportunity to have a good, restful sleep".

The other thing is, obviously, the things that are good for the rest of our lives, like making sure that we're paying attention to what we're eating and drinking. Caffeine is the most obvious one. You know, for most people, if you have an espresso right before you hit the hay, it's not going to be a good experience, but even having a big, stuffed meal, you might have a difficulty falling asleep. And, even alcohol, which you know, normally kind of suppresses brain activity, at the outset, it might make you feel sleepy, but you might find you're actually waking up during the night. And, the other piece of information people give is that, if you find that you're 20 minutes in bed and you can't fall asleep, then probably the best thing to do is to kind of get up and do some ritual or some routine to kind of take your mind off whatever's going on because, typically, if you're in bed for 20 minutes and you're not falling asleep, it's because you're actually ruminating about the things you have to do tomorrow or the things you didn't finish up the day before. So, don't sit there and keep ruminating. Just move yourself off into another activity and then try again. Some people, especially in your younger years, might think of needing very little sleep as a badge of honour. It means that you're really productive and you're really working all the time towards your goals, but I think you need to reframe that now because we recognize that, in fact, you're doing yourself some harm if you're not taking care of that necessary sleep component for brain health. [music fades out]

Heather 43:01

Tip number four, [electronic chime] try new things. [gentle electronic music] We all know that keeping your brain active and stimulated throughout your lifetime is important to good brain health, but how exactly do you do that? Are sudoku and Wordle effective? Or, are they just a lot of fun? And, what do scientists say are the best skills and hobbies to pursue to help stave off cognitive decline and memory issues? For the latest science on this, we turn to Dr. Donald Weaver, Neurologist, Medicinal Chemist, and Senior Scientist at the Krembil Brain Institute. [music fades out]

Dr. Donald Weaver 43:41

[glitchy electronic music] Keeping your brain engaged and stimulated is one of the most important things you can do for your cognitive wellbeing and your mental health. Over the years, I've had lots of patients ask me, "What can I do to keep my brain healthy? Are there brain exercises I can do that will, you know, keep it young, keep it healthy, keep it vibrant?" I hate to fall back on the old "use it or lose it" sort of expression, but there is an element of truth to that when it comes to your brain.

Your brain is complicated. It's built on many, many connections, and it's good to keep these connections active, and the best way to keep these connections moving is to learn a new hobby, is to learn a new skill, to do something that's going to keep your brain engaged. This isn't like a medicine. This isn't me writing a prescription for you, saying, "Yes, you know, do this particular sort of brain activity".

Everyone's brain is different, everyone is a unique individual, and I think that, really, this should be an activity that you find interesting, that you can stay focused upon. It's an activity that should be challenging and complex, but it's an activity that you should actually enjoy, and enjoy doing often and practicing. There's this neurotransmitter in your brain called dopamine and, if you actually enjoy what you're doing, your dopamine goes up, and that's good as well. So, when you're pursuing this new activity, make sure it's something that you like, it's something that you look forward to doing every day.

Certainly learning new skills really exercises your existing pathways and encourages the development of new pathways. It does. Your cognition, your memory, your intellectual processes are really built on the

complexity of the pathways in your brain. So, anything that keeps these pathways healthy and encourages existence of new pathways is ultimately going to be good for you. You know, does it physically create new pathways? These pathways are there, but they may be dormant, they may not be active, and we're nudging them back into life by having to do new activities. So, this is an evolving science but, you know, when it comes down to it, this isn't going to hurt; it could only help.

[upbeat electronic music] Getting engaged in a hobby, a new skill, as we've mentioned, increases connections in the brain and, in doing so, this really does help mental health. It wards off depression, and certainly there is a very strong connection between depression and dementia. Depression is recognized as a risk factor for dementia, and dementia itself is a risk factor for depression, so there's a complicated relationship between the two, and any activity which can reduce the likelihood of depression or anxiety, certainly contributes to mental health and, in doing so, once again, translates to a reduced likelihood of getting dementia in the long run.

There's all these studies on multilingualism. You know, people who speak multiple languages seem to dement at a slower rate, so I have been actually studying Latin in my spare time now for years and, as a hobby, I actually take Latin poetry and try to translate it to English. I find this great fun. [chuckles lightly] I suppose that's a comment on me. You know, maybe I should get out more. Everyone, you know, is different and taking a complicated Latin poem, trying to understand it, and trying to understand it in English and translate it into English is something that I personally thoroughly enjoy, and this has been my own personal attempt at becoming proficient in another language. [music fades out]

When we encourage people to pursue skills and hobbies, I think the complexity and the challenging component of it is important. What we want to do is have the brain challenged so that these new connections, these new opportunities for the brain to literally explore itself, are nurtured and are enabled. You know, I used to call my waiting room "sudoku central". I would go out to the waiting room, and it was filled with people, all doing sudoku puzzles, and they're going, "Well, it's good from my brain," and my attitude towards that is, "It's a puzzle that's very similar, and therefore, you're doing the same task over and over and over again. You really should be challenging your brain to do different things," and I think that's why I like a second language. Language is so complex. I mean, one day, you're learning language to describe the colours, the next day, you're learning language to describe emotions or other aspects, and this really is very rich in its ability to literally hop, skip, and jump over the surface of your brain, visiting different strengths and areas of your brain. You know, colour, music appreciation, could be whatever it is, all of this is firmly rooted in language, and so an activity which involves language, I think is quite useful but, you know, if that's not what you want, don't do it. You have to do something that you enjoy, that you're going to stick with, that you're going to stay focused on, and that you're going to find rewarding when you do do it.

[pulsing electronic music] I often get asked, "Is it too late?" It's never too late. You can always try to start learning some new skill, some new hobby. Regardless of your age, there is benefit to be obtained, and I would enthusiastically suggest that you pursue it. If you are concerned about your cognitive health and you want to incorporate this learning a new skill or a new hobby, yeah, there are some rules of thumb that I think you should follow. Stay focused at it. Don't do it for a week, then give it up. This is something that you have to do for a prolonged period of time to get the benefits from it, so stay focused. I think that you should actually schedule time to do it. It's not something where you go, "Oh, yeah, I'll do a half an hour a week if it crosses my mind". No, no, this is you working on your cognitive health, your cognitive wellbeing. This is important to you. Try to be rigorous, try to do it. This is something that you should look forward to, going, "Yes, yes, I'm going to do this at nine o'clock," and you're all excited about

going, doing it. Make it challenging, make it complex, but make it something that you enjoy. [music fades out]

Heather 49:50

And finally, tip number five, [electronic chime] keep moving. [upbeat electronic music] Did you know that physical inactivity and a sedentary lifestyle are actually considered risk factors for dementia? We've known about the cardio and aerobic benefits of exercise for a long time, but the latest research clearly shows that a moderate and consistent balance of both physical activity and exercise is crucial for brain health, as well. And, yes, there is a difference. Here's more from Dr. Aleksandra Pikula, a clinician investigator with the Krembil Brain Institute and Director of Stroke Research at UHN. [music fades out]

Dr. Aleksandra Pikula 50:35

[rhythmic electronic music] Exercise is extremely important because it can benefit your brain in many ways. First of all, as we mentioned, it can promote better heart health, it can improve the blood flow to your brain, it can reduce inflammation and improve health of brain immune cells and protect your brain from the illness, it can lower level of stress hormones and improve the mental health, and it can increase the levels of many different brain-produced products factors, proteins, one of them called BDNF, so-called brain-derived neurotrophic factors. It's almost like a Miracle Gro for the brain that plays a critical role in cognitive functions, shapes your learning and memory, and in many studies, it has been observed in population and clinical studies, human and animal studies, that essentially this particular part called BDNF that I just mentioned, strongly, strongly impacts the growth of the brain.

We also studied in the Framingham Heart Study, you know, how essentially the levels of BDNF and the effect of physical activity and exercise can improve the levels of BDNF, and the higher that BDNF—or that Miracle Gro protein is—people do better in terms of their cognitive performance. But, more so, it shows also that people who have higher levels of this BDNF protein have larger brain volumes, have bigger hippocampus, essentially the memory centre within the brain. They also have better integrity and connections within the brain cells, but this also reduces the risk of vascular brain disease such as stroke and lessens the risks of any type of dementia.

The benefits from physical activities and exercise are really tremendous for patients with dementia, Parkinson's, mental health conditions, multiple sclerosis, as well as stroke. Any physical activity is good, but there is a certain amount that is optimal. It's really a balanced exercise, that is proposing moderate exercise such as brisk walking, short, recreational biking, gardening, vacuuming, or recreational swimming, vigorous, intense aerobic activities such as running or dancing or stationary bikes, lap swimming, or perhaps resistance training sessions. And, there are certain amounts of each that are recommended to be done, so, for example, moderate exercise, about 150 to 300 minutes a week, which brings you to roughly 20 to 40 minutes a day of moderate exercise, about 75 minutes of vigorous exercise, which brings you to roughly 10 minutes a day, which is not a lot and it can be done, and this has to be coupled with some resistance training at least once or twice a week, with what's recommended also for our elderly population or aging population, to also incorporate some balance exercises such as tai chi or perhaps yoga. And, those type of exercises that can improve balance, they're not vigorous, but they essentially can optimize and prevent falls in the elderly population.

But, talking about brain health, any exercise is good. However, high baseline aerobic fitness, as well as good motor skills, have been really related to the higher level of working memory and attention, better cognition, and even delayed cognitive decline. Regardless of age. Any exercise is good for you for any amount of time. It's never too late to start [music fades out] and it's really important to remember that

by taking simple, small steps, even in minutes and increasing that, at any age, doing it regularly, trying varieties of it, it's more sustainable, and the good long-term effect on body and brain needs to be achieved really through, you know, exercises that will bring the strength, endurance, flexibility and balance. So, it's really important to combine different types of physical activity and exercise and understand that those two are very different. Physical activity is any activity that moves the muscle and uses the energy, while exercise is planned, well-designed activity and its structure, that it improves physical fitness. Both have shown to improve brain health, so it's good to do both.

We shouldn't forget that exercise also has amazing benefits for mental health. So, exercise does increase your brain ability to take up serotonin which is one of the happy hormones in the blood, and increased dopamine production, and can improve depression, as well as anxiety. And, exercise usually lowers the blood levels of serotonin and increases the blood levels of dopamine, so it's essentially an excellent boost to improve the mental health. I spend the day talking to my patients about how important physical activity is, and exercise, and it's also important for us to do so. So, I love nature. I really like long walks with my family and our dog after work, most of the days. [gentle electronic music] We like to hike. I usually like outdoor biking. I must be forced to do a little bit of stationary bike, like peloton, I'm not big fan of that, but that works for many people. My daily routine is yoga and stretching and meditation. It is really important to understand that physical activity and everything we do on a daily basis is important for our brain health. Each hour of light-intensity physical activity, or even achieving 7,000 steps daily, is equivalent approximately of 1.5 to two years less brain aging. So, start small, build up from 10 minutes, but make sure you can do it every day. Take a friend with you, take a family member, walk with the dog. Everything counts. [music fades out]

Heather 57:25

Thank you to Doctors Andrea Furlan, Jaideep Bains, Mary Pat McAndrews, Donald Weaver, and Aleksandra Pikula for joining me on the podcast today. We hope you enjoyed the episode and that you're inspired to keep your brain fit and healthy for many years to come. This is our last episode of season two. We've had an amazing run. We'd like to thank the patients and their families who so generously shared their personal stories, as well as the scientists, trainees, clinicians, and staff members at Krembil who participated in the podcast this season. I'd like to say a special thank you to our amazingly talented production team, Dr. Amy Ma, Carly McPherson, Jessica Schmidt, Twayne Pereira, Sara Yuan, Megan Andheri, Suzanne Weiss, and Kratika Singh.

If you're interested in learning more about the innovative research and clinical advances at the Krembil Brain Institute, check out our website, uhn.ca/krembil. You will also find all of our episodes and a whole bunch of awesome additional content there. We'll be back soon but, in the meantime, we'll be releasing some special bonus content over the next couple of months so keep an ear out and, if you haven't already, be sure to subscribe to Your Complex Brain so you never miss a thing. Thanks again for listening. Have a great day. [music continues then fades out]