Different Types of Memory – Kimberley Meates and Vanessa Bowie

In this interview, we discuss the different types of Memory with Kimberley Meates and Vanessa Bowie. They include Long-Term Memory, Short-Term Memory Explicit Memory, and Implicit Memory

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Transcript:

Kimberly 0:00
And as you recall information each time that you recall, it is not the same pathway. Exactly, it can get a little bit different. So we don't recall events exactly as they happened. And we don't recall them exactly as they were initially encoded. Each time in your colon, it can change a little bit.

Bill 0:21
Yeah. So is it true then what you're saying is true that what we remember is a memory of the memory?

Kimberly 0:27
Yes, yes, exactly. That's for everyone. That's brain injury specific to everyone.

Intro 0:38
This is recovery after stroke with Bill Gasiamis helping you go from where you are to where you'd rather be.

Bill 0:46
Bill from recovery after stroke.com This is Episode 77. And my guests today are Kimberly Meates and Vanessa Bowie. Kimberly is a clinical neuropsychology registrar with clinical experience working across a diverse range of settings including acquired brain injury, inpatient and community rehabilitation, mental health, and pediatrics.

Bill 1:08
Vanessa completed an undergraduate degree and I graduate diploma in psychology and has just begun a master's degree in occupational therapy. Both ladies are currently gaining experience working in the domain of health under the loving guidance of Dr. Judy Tang.

Bill 1:25
Are you a stroke survivor who wants to know how to heal your brain overcome fatigue and reduce anxiety? By the time this episode goes to air, I will have been eight years into my stroke recovery journey. Three brain hemorrhages and then brain surgery created similar challenges for me.

Bill 1:40
The thing is very few people understood what I was dealing with the only people that did understand what other stroke survivors did. One of the unexpected nice things that came out of my stroke experience is that I have been asked to share my story several times in newspapers, the national news, and as a speaker at various corporate events in the hope of raising awareness.

Bill 2:00
And to support other people who are going through stroke. Now, most recently, I was involved in the launch of a joint advertising campaign by the Cancer Council of Australia. Quit Victoria and the Stroke Foundation, which is called smokes led to strokes. The aim was to encourage more people to quit smoking and decrease their risk of stroke.

Bill 2:19
Being involved in these campaigns made me realize that stroke prevention is

important. However, what I needed when I experienced a stroke was help to bridge the gap in a critical time after I went home, realizing that the amount of support drastically declined once a stroke patient left the hospital motivated me to create a way to support stroke survivors so that no one has to do it as hard as my family and I did.

Bill 2:43
If you have fallen in the cracks between hospital and home care, and desire to gain momentum in your recovery, do not know where to start. This is where I can help. I will coach you and help you gain clarity on where you are currently in your recovery journey.

Bill 2:58
I will help you create a picture of the way You would like to be in your recovery 12 months from now, and I will coach you to overcome what's stopping you from getting to your goal. During coaching. I will also teach you the 10 steps to brain health for stroke survivors and guide you through each step with supporting interviews from experts and information that is based on the latest scientific research.

Bill 3:22
Some of those steps include training on the type of mindset required for ongoing successful recovery and how to decrease anxiety created by the thoughts of another stroke. There will be a module on emotional intelligence which will help you manage out-of-control emotions, information about the gut, and how a healthy gut is the first step to a healthy brain.

Bill 3:45
And we will cover nutrition and the kinds of food required for reducing fatigue and there will also be a module on how to improve sleep and much much more. If you're one of the first 10 people to join recovery after stroke coaching, you will get a one-on-one private coaching thread with my access to the course 10 Steps to Brain Health the Stroke Survivors.

Bill 4:05
When released access to members-only monthly group training calls and access to stroke survivors' private forum, the first 10 people to join also get more than 70% off the full price of 599, and 12 months of access will only cost you $149.

Bill 4:23
Be one of the first 10 people who apply for recovery after stroke coaching now and get the first seven days free. After the seven-day free trial, you will only pay the annual amount of 149 and the price of renewal will never increase for as many years that you stay a member.

Bill 4:38
Once the first 10 coaching packages are sold the price will never be offered again. So take advantage of the seven-day free trial now by clicking the link below if you're watching on YouTube, or by going to recoveryafterstroke.com/coaching if you are listening online. Now it's on with the show. Kimberly and Vanessa, welcome to the podcast.

Vanessa 4:59
Thanks for having us

Bill 5:01
Thank you so much for being here. I'm excited actually because, you know, before you become a stroke survivor, you don't know anything about the brain. And then when you become a stroke survivor, what you need to do is find out everything you can about the brain.

Bill 5:17
And most stroke survivors don't know anyone who knows stuff about the brain. Because we don't generally hang around with psychologists or neuropsychologists occupational therapists, you guys are few and far between you guys are like gems.

Bill 5:31
So when I come across people who study the brain or help people recover from injuries of the brain, I get excited. I've kind of latched on and Dr. Judy Tang, who you guys are working with at the moment was somebody that I've spoken to at the beginning of my stroke journey.

Bill 5:51
And she helped give me some useful information about how I can go about supporting my help and that was informally just When we got together at different events, I'm wondering if you guys could share with me what some of the different kinds of memory are.

Bill 6:10
So that we can create a conversation with people listening who may be struggling with memory at the moment about how they can utilize the different memories to support them when they're in recovery.

Different Types of Memory – Two major categories

Kimberly 6:27
Yeah, definitely. So memory is a very well-known concept within the general population. But the understanding I guess, about what memories is a little bit lacking. So I'm really glad that you asked that question.

Kimberly 6:44
So we can kind of go through the different memory components and how you can use them. So we think of memory being split into two major categories. And so it's kind of like the unconscious memories and The conscious memories.

Kimberly 7:01
So unconscious memories, those things like riding a bike, once you've learned that process, you sort of never forget that that's always stored in your memory. But you don't have to think about when you ride a bike, you're not thinking that I have to move my leg this way to do this to do that. It's just automatic.

Kimberly 7:21
So that's the sort of unconscious memory. So it's very procedural. So it's like a step-by-step learning of general motor skills. So that's a great thing to focus on in brain injury because that's one of the areas it's relatively spared in most injuries to the brain.

Kimberly 7:45
So in rehab, we can exploit that we can focus on teaching procedural steps, and then the brain will take that on automatically and just do them automatically. So that's a really good area to focus on in rehab.

Bill 8:01
How is it that that unconscious memory thing is mostly not impacted by most strokes? How is that something that we get away with?

Kimberly 8:13
Um, it's generally because of where it's sort of stored in the brain. So it's stored throughout the brain. And the cerebellum sort of at the back part of the brain is very involved in motor movements. And the storage of that knowledge.

Kimberly 8:38
I mean, it can be impacted, but it's just generally that those areas said, I guess it's not true in every case. Yeah. But it's Yeah, that's sort of my understanding. I don't know if you've got any insight on that.

Vanessa 8:55
I think because mostly the temporal lobe depending on the type of stroke as well. So if these sorts of memories are being stored in the cerebellum they might not be affected as largely as the temporal lobe.

Kimberly 9:11
Yeah, so it's kind of similar. That is my understanding of it it is more in the cerebellum. And when you have impacts

Bill 9:25
So that's cool. So these memories are unconscious or kind of learned through rote experiences, like riding a bike, etc. They kind of hang around for most of the time, and you guys can make use of those memories and help people in their recovery when they're getting back on their feet, for example, is that right?

Kimberly 9:51
Yeah, absolutely. Um, so, it's about sometimes you do have to relearn those steps. So it can be a relearning process, but they are the process of taking the steps and then getting it into automatic memory. That still is a process that can work following brain injury.

Kimberly 10:17
So that's what a lot of the rehab will focus on teaching people step by step to go through each of their daily activities. So that it does become automatic. They don't need to think about it anymore. It's just an automatic process for them.

Bill 10:31
Yeah, okay. , I find it interesting. The automatic process, you know, when I was in rehab and trying to get by walking back, my left leg was numb, I couldn't feel it.

So the sensory neurons weren't telling my brain that the leg was on the ground or when it was telling my brain that it was kind of giving mixed signals.

Bill 10:53
So I my knee wasn't working properly, it would sort of buckle underneath me and I would trip over or I would feel unstable. I remember going through a process where I was meditating on the process of walking.

Bill 11:12
So you haven't walked yet. And I was using meditation to visualize myself walking, what kind of memories and I'm getting a smile there, what kind of memories are those imagining yourself walking? What kind of memories are they sort of stimulating?

Kimberly 11:33
Well. So it's going through back through your previous experience. So previously, you were able to walk. You can imagine yourself walking, you see people walking in the street, and you have that motor memory in your brain already.

Kimberly 11:48
It's just like you're saying the connections, sort of blacking the connections have got a bit mixed up. It's when you're imagining it. It's almost like you're doing it. those networks activated except that your body's not moving.

Kimberly 12:04
So this is the signal that says, body Don't move, but I'm going to picture it in my head, and going to go through each of the steps of the circuits being activated for walking. So you're essentially practicing that circuit and re-forming those connections in your mind when you picture it, which is fantastic in a way.

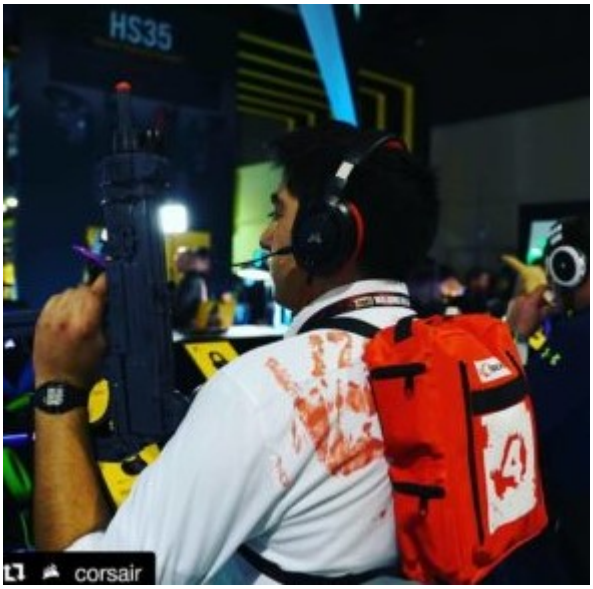
Bill 12:25
It is fantastic, because it doesn't take a lot of effort, and it's not as exhausting. But so what you're saying is that two things are going on there with that learning how to walk again, there is a memory, and is that memory in that circuit? Is the circuit the memory?

Kimberly 12:42
Yeah. So memories, are just a bunch of neurons. That's what our brain is just made up of neurons, and they form connections between each other. So when

they connect they all fire together, all very closely, followed by each other.

Kimberly 12:59
That's sort of What makes the circuit so within that circuit, that's where all the information is.

Using VR to stimulate muscle movement



Vanessa 13:05
So yesterday, I went to an expo, and there were the neuro people there. So they've got occupational therapists and such. And they're using VR to try and help retrain people for movement. And I found that fascinating.

Vanessa 13:23
So even from the sense of when you were making your breakfast, they now can do that with virtual reality. And the person can use that to go and get all of the ingredients out of the fridge and then put it all together. So you don't have to be able to physically get up and go and do it. But you're using this to retrain your brain to go through those processes.

Bill 13:47
In Episode 68, I spoke to George Teufl and Andy Gstoll, who were from a company called Rewellio, and they were working on a visual reality. software package that when you bought the goggles, you were able to plug into their software and play certain games and imagine certain things working. So this particular event that you went to what was it called?

Vanessa 14:17
That was the Seniors and Disability Expo. So that was at the Melbourne Convention Center, right? And so there are all sorts of people there who were providing, like aids to help people be able to complete tasks in their home or get around in the community. And there were also people there that were to help with sort of the funding plans or where they could go.

Vanessa 14:50
So I know I was there with occupational therapists, as well. So just providing information to people about what's available to them and who they can access So this virtual reality thing that I tried was from a group who have occupational therapists, and they were just telling me about how they're using the virtual reality for people who are going through rehab, just to remake those connections, when they weren't able to get up at the time.

Vanessa 15:23
So they're currently still working on that with time I got to try a particular game, which was just arm movement, so you have to chop these blocks and everything, and it was just getting your arms too, to move around and also for reaction time and everything like that, because, of course, you have to get it within that period. And it was great. It was really interesting.

Bill 15:50
Yeah, I know that you've just started your master's in occupational therapy. Have you spent a fair amount of time in the hospitals helping people get back on their feet and retrain their arms, etc.?

Vanessa 16:04
Not at this stage. I've only been studying this now for about five months. And so I just finished my first placement which was a community health setting. So, hopefully, in my future placements, I will be in a hospital setting working on rehabilitation.

Bill 16:23
Yeah, so what's interesting is the new breed of occupational therapists is embracing this kind of stuff. I saw a glimpse of it when I was in, Parkville Rehabilitation Hospital which is associated with the Royal Melbourne Hospital. One of the things that got me to do to help retrain my left arm was to play virtual

tennis on the Nintendo Wii.

Bill 16:48
I'm terrible at normal tennis. I was no better at this tennis. But it was a fun way for me to just be in a safe space, holding a little control, which was a hold that had a rope in case I let go and flew at somebody's head.

Bill 17:08
I used the virtual reality game there to help me retrain my left arm to swing and twist and hit this ball so that it could go into the other side of the virtual court. And what was interesting is that I've never played tennis with my left arm before.

Bill 17:33
And I don't think I would have been able to manage to do that with a real tennis racket, but this was a gentle way to help me bring back these memories that I needed to re I'm not sure what the word is reinvigorated or bring back to life so that my arm could do things like picking up my toothbrush or picking up a pen or a fork or a knife.

Bill 17:59
Because I was spending a lot of time trying to retrain myself. I noticed that when I would go scratch my eye would go a little bit too not my eye, but I'd go scratch the skin around my eyes a little bit too far and poke myself in the eye. And I did that so many times.

Vanessa 18:17
So it was really sort of also trying to retrain your spatial awareness as well, I guess.

Bill 18:23
Okay, that's interesting. Yeah, because I did struggle with that, and also still struggle that when I get tired, the doorway on the left-hand side seems to just appear out of nowhere, and I often bump into it. So this world of virtual reality is starting to take shape.

Bill 18:39
What other memories can it help support if we're, bringing it back? If we're using virtual reality to support learning how to walk again or to visualize how to walk again, there's no limit really to what it can do or what it can help with.

Vanessa 19:00
Yeah, there's quite a lot of things that it's being utilized for, like, I know at the moment, they're using it for people in nursing homes, who aren't able to revisit places that they've been to before. So it's also useful for, it's useful for memories and retraining, but also overall well-being and happiness.

Vanessa 19:26
So it's allowing the people who are using it to go and revisit different places around the world. Quite often it's using something like Google Maps so that they can see this area and revisit that, or even with sports, they can use virtual reality, if they aren't able to do it anymore.

Vanessa 19:48
Like you said, doing the lighter sort of activity because you wouldn't be able to do like real tennis but they're still able to do something like that, and then that's positive for the person who's using it.

Bill 20:01
Wow.

Kimberly 20:06
In a psychological sense, so in PTSD. So if veterans are coming back after, a deployment, and they have PTSD, they're able to recreate sort of a similar scenario war scenario without the risk, obviously, and help them to overcome those post-traumatic memories. So it's being used in a lot of fantastic ways. Great.

Bill 20:38
Wow, cool. So we've spoken about unconscious memories, what are the other kinds of memories.

Implicit and Explicit – Different Types of Memory

Vanessa 20:47
And so the unconscious memories were mainly what we call implicit memory. So those were the procedures. We've also got ones that are called explicit memories. So more things have happened to you.

Vanessa 21:02
So you will remember a birthday or your first day of school, for instance, or general fact information, so things about the world. So these memories are stored in the hippocampus. So that's in the temporal lobe, and the neocortex, which is part of the cerebral cortex.

Vanessa 21:25
And then close to the hippocampus, we also have the amygdala in the temporal lobe as well. So those are involved in like the explicit memories. And then we've also got short-term memories, which are mainly in the prefrontal cortex. So at the very front of your brain as well.

Bill 21:43
Okay, so explicit memories, give me an example of an explicit memory.

Vanessa 21:48
So that was the one let's say, you went on this fantastic holiday, and it's you did some sort of experience, maybe bungee jumping or something and you just remember that well?

Bill 22:02
I won't be doing that thank you.

Vanessa 22:04
I don't think that I would be able to either.

Bill 22:08
So it's something that you remember well, and what helps you remember it well? Is it the physical part of that experience as well? So bungee jumping thing? I would imagine a massive physical response, Is that somehow tied into memory? How do you actually what is it how you embody that experience as well?

Kimberly 22:30
Yeah, all the sense of sort of encoded in that, particularly, emotion is a really big key in memory. So we often remember things that are quite emotional. Imagine bungee jumping would be terrifying. So that is encoded.

Kimberly 22:50
So there is that part of the brain called the amygdala which is involved in fear and processing that emotion and that's linked in with memories as well. And that's why we often remember things that are scary or that fear response.

Bill 23:07
Okay, cool. That's an explicit memory. So now a short-term memory. I know what short-term memory is, most people will know what that is. That's a memory of something that happened very short term. But what I noticed is a lot of people struggle with short-term memory, even before they've had a brain injury. The classic example is "Where did I just put my car keys?"

Bill 23:31
So where is the difference? Where is short-term memory stored? And is it in the same places as the other memories or is it somewhere else?

Kimberly 23:44
So short-term memory is not like storage as you would think. Short-term memory is very short. Short-term memory is just like in the next five seconds, sort of keeping that it's like RAM in a computer, just keeping whatever is happening at that time in your mind keeping it in there for enough time that you can either forget about it or that it gets into longer-term memory.

Kimberly 24:11
So it's really short time frame. So when we talk about long-term memory that's

sort of in 20 to 30 minutes, that that's when we start thinking about that. So long-term memory now, so short-term is very, very short.

Kimberly 24:26
And it's not a memory and such it's just some just holding information in your mind for some time before it either gets encoded, or it's forgotten about. So it relies a lot on attention. So being able to attend to information and to hold it in your mind is quite difficult.

Kimberly 24:51
And it's more those frontal, the frontal part of the brain, that involved in that to being able to hold that information It's a really common experience, particularly following any sort of brain injury. A lot of people are impacted by that. And attention can also impact on that as well.

Bill 25:10
Okay, so might be a combination of things happening, you might be lacking the ability to pay attention to something or to concentrate on a task, which then impacts that short-term memory.

Kimberly 25:20
Yes, yeah, exactly.

Bill 25:22
Okay. So when I, when I'm, quote, unquote, normal, I haven't got a brain injury. And I walk in and have my kids and I throw him in an unusual spot. And I'm doing a kind of automatically just to get them out of my pocket or out of my hands. Is it that is it that not being mindful of that task? I'm putting my keys on the bench which kind of interferes with that memory.

Vanessa 25:49
Yes. Because you're not paying attention to where you put it you're not thinking about that you've put them there. So you're not going to make those connections later on as to where you put them. Whereas, if, for instance, you have a particular spot where you put your keys, and that's where they go every day, that becomes a learned habit.

Vanessa 26:11
So you will know next time, that's where my keys are.

Kimberly 26:15
Yeah, it's an intentional thing and that's a normal experience for everyone. So people come in and say, Oh, I got problems with my memory, I keep misplacing my keys, I really (inaudible) But those all to do with attending or attention.

Kimberly 26:35
Because we're just sometimes we've got other things in our mind, we're not paying attention to what we're doing. So that's not a memory problem per se it's an attentional problem.

Bill 26:47
That's good to know. And I think it's going to be a relief for a lot of people listening because there is this thing that you hear people say often that man my memory is terrible. Like I never can ever remember where I put my keys or You know, I don't know what I ate yesterday is that I don't know what I ate yesterday a short term or long term memory thing.

Kimberly 27:08
That's long-term memory. I'm so that's. But that, again, is also because we do a lot of things in our day. If we were to concentrate on everything that we do to install that information would be overwhelming for our brain, that's way too much information.

Kimberly 27:24
So our brain that's why we have an attentional system. So it takes everything into the senses, then it decides what's important, what do I need to focus on? What's important? And then from that, once you've been focused on something, do I need to remember this?

Kimberly 27:41
Do I need to store this for later? Is this going to be useful? So for most people, remembering what you had, you know, a couple of days ago? Not so eventful, unless it is an amazing five-star meal. Yeah, for most people, that's not essential information.

Bill 28:00
Unless It was the terrible, terrible meal and it gave you diarrhea and you want to know, because you're at the hospital and you're telling the doctors, this is what I ate.

Kimberly 28:09
Might be helpful to remember it in that case.

Bill 28:13
Okay, well, that's a relief. I like that. I'm asking these questions because I've never asked them before. And I've always associated not remembering what happened two or three days ago, etc., as not necessarily a good thing.

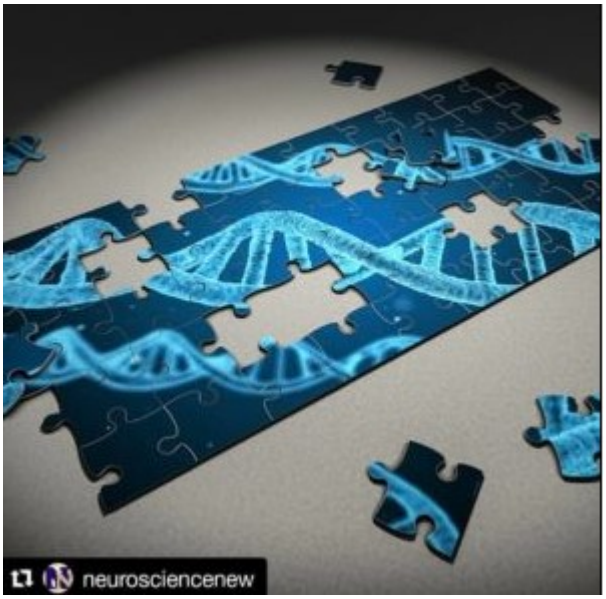
Bill 28:26
And especially when I was recovering. Months later, somebody would say to me, I came to visit you or when I came to visit you, etc. And I wouldn't have remembered that they were here. And even though they came from a long way away into the state, I kind of said like, I don't remember and I'm not sure whether or not what was happening and I kind of felt bad that I didn't remember that they came.

Kimberly 28:54
Following injury, there is sort of a period Where the brain still recovering. So it needs time to sort of settle down this is, you know, the chemicals are out of balance. There's a lot of things happening during that time. So it does make it difficult to lay down new memories at that stage. So that I'm not sure how fast the injury was, but that was,

Bill 29:26
It was probably around five, or six months past the injury. The second time that I experienced the bleed in the brain, the blood clot was about the size of a golf ball and it was near the cerebellum. And it was kind of just sitting there while they were working out how to deal with it.

Bill 29:44
So took around about it took around. And at that time, what that blood clot did was impacted. My ability to type an email concentrate, finish sentences, you know, recall stuff that has just happened to me, it was very difficult for me to keep appointments and remember when they were even though I had written them down in a diary and had reminders and all that type of thing.

Short-term memory loss while recovering from brain injury



Bill 30:10
So, when somebody so I was feeling quite bad about constantly missing appointments, and I was feeling quite bad about not being able to type an email, drive all those things, and then when, when somebody said to me, I came to visit you. And I said, Well, I don't remember. It made me feel even worse. So it was around about it was around about four to six months after that second major bleed.

Kimberly 30:39
Hmm, well, we generally think of recovery as a long-term process. So most recovery will sort of happen I suppose two years following injury. But as you know, it can extend further along than that. I suspect it was. It wasn't anything You were doing it wasn't any malice, that's just that the brain was still recovering at that stage.

Kimberly 31:07
And if it's not someone that you see regularly, that also can impact how your brain is processing the information, like I was saying before the importance of the information and, and kind of selecting what I need to what I need to know for now. And particularly in that in that recovery process, your brain doing that even more so limited resources too.

Bill 31:37

Can we talk about those limited resources in the context of occupational therapy because it's a really big issue? When somebody's recovering, the brain trying to just manage, I imagine all the regular tasks. It's got parts of it that are offline. It's trying to learn new tasks.

Bill 31:57
It's been impacted and it has a physical injury. Whether it be because of a blood clot, and lack of oxygen, or because of a bleed, and now occupational therapists are amazing as they are making do even more work.

Bill 32:11
So how does it? How do we deal with the energy side of or the amount of energy that's required to support the brain and then do memories and do all those know where I'm going with this? I'm going to edit this out a little bit. So where was I going? So I was trying to understand how energy impacts or the way that the brain uses energy impacts the ability for occupational therapy to be done.

Vanessa 32:51
Sorry, I just have to think about that.

Bill 32:53
That's all right.

Vanessa 32:55
Because I mean, one of the major things is that you need to make sure when you're working with someone that you're working within the sort of energy scope. So if you're being overwhelmed with information, you're not going to be able to attend to those things.

Vanessa 33:15
So I think that the approach that would be needed is to slowly reintegrate some of these things and come up with certain ways of, say, helping you remember what you need to do or what you might have coming up.

Vanessa 33:32
So perhaps coming up with some more simple ways of doing that rather than complex instructions and just giving you too much to think about because you're thinking about recovery physically, as well as mentally and you're trying to regain your memory. Yeah.

Bill 33:52
I remember being in rehab I spent a month in rehab and the nasty occupational therapists were getting me to make my breakfast. I thought and maybe they explained why we were doing it. But I don't know now if they did or didn't and if I was able to remember or not.

Bill 34:08
So that was this is after surgery. So my stroke experience and my bleeds in the brain lasted around about three years. So I had my first bleed in 2014. Then in March, sorry, the first bleed in 2012, in March 2012, and then in November 2014, which then led to surgery, and it was between November 2014.

Bill 34:31
And, just before Christmas, I was in rehab. And I found myself being frustrated and annoyed because I had to make my breakfast and my left hand wouldn't work properly. Why do occupational therapists make us do that?

Vanessa 34:49
Well, so my understanding as I'm still sort of fresh into the OT, but what they would have been trying to do is so we call it activities of daily living and so that's where something that a person will do to take care of themselves, or just tasks that they do in their everyday life.

Vanessa 35:10
So what they would have been using that for is firstly to see how your brain is still working to make sure that you can follow the procedures needed to make your breakfast, and then using that to assess what they would need to do to try and help you achieve that to make sure that when you are back home, that you're able to do those tasks.

Vanessa 35:36
It's really important so there are things they might have like getting you to brush your teeth or those sorts of things. It's just making sure that you can do those activities of daily living for self-care.

Bill 35:48
Yeah, I found it amazing at the time I was stunned that I was in the hospital being supposedly looked after by all those people then they'd make me make my breakfast.

Kimberly 36:02
Say on that point is it's it's a delicate balance, particularly in those early stages, because you, the brain at that point is at its most plastic. So it's able to make the most changes at that early stage. That's probably the theory behind getting in there and trying to get you out of bed to make your breakfast.

Kimberly 36:27
So it's, it's good to do as much as you can do that will optimize the brain's ability to make new connections and to form those skills that you need. As you said, it's fatigue is often a huge problem following brain injury.

Kimberly 36:46
So it's that balance of finding, yeah, finding the right balance between not pushing too much that you're going to push to that level of fatigue where you can't learn anything. But also being able to use that early stage to form those new connections. So it's not an exact science sometimes as therapists, we get it wrong.

Kimberly 37:14
And the intent is really to try and get you as much recovery in that early stage as you can. I think small steps are really good. So just doing something small amount of time that frequently so if you're able to manage, you know, five minutes of doing something, then stop, have a rest.

Kimberly 37:35
Do another five minutes in an hour So, so frequent, performance is good, but also make sure that you're resting in-betweens because rest we know can help cement those memories for us. Yeah, we need them both.

Bill 37:57
Yeah, sure did. The risk was really important. So I was noticing that at the beginning of rehab, the first week of my month in rehab, I maybe was able to do a couple of minutes worth of physical effort. And then I was wiped out for the rest of the day.

Bill 38:13
And as that time grew, as my time in rehab continued, I started to notice that the two minutes became four minutes, for example. And then by the time I left, maybe I was able to do three sessions a day, and those three sessions a day might last

half an hour a day, or half an hour per session.

Bill 38:33
So it was really good to be able to observe how much I had come, how far I've come in that short amount of time in that one month. And that made it that gave me a lot of hope for when I get home. If I'm able to continue improving the way that I was improving I'll be a further quite a long way ahead for the time 12 months of lapsed.

Bill 38:59
So to go back to those early days of making connections at the very beginning of rehab, when you guys say the brain is most plastic, where taking advantage of those unconscious memories, those neural pathways that have been interfered with.

Bill 39:21
And single signals aren't getting through perhaps. So we bring those to life as well as rerouting and making new ones to take over where the old ones perhaps aren't being where the old signals are not good at the moment.

Kimberly 39:41
I'm are you saying whether the damaged neurons can reform the connection is that what you're asking?

Bill 39:48
Yeah, so I'm asking. So I feel like making a toast or cup of tea is tapping into those unconscious memories. If that's what I'm doing, and the signal has been interfered with so that I can't make the connections.

Bill 40:09
Are we bringing the connections back to life? The ones that have been damaged or put out of action for now? And at the same time, are we rerouting from those and making completely new ones?

Kimberly 40:24
It can be both, so it depends on the extent of the injury, if there are some neurons, there are some neurons that die as a result of the injury. They are usually right in the middle where the injuries around that area, some neurons can be saved, or they can also die.

Kimberly 40:44
So that's what they call the Penumbra. It's the area that surrounds the area of injury. So there's potential there for the neurons to form new connections. And that's was saying, in the early stages, it's really important to get that intervention in so that those neurons don't die, they need that stimulation to keep the connection alive.

Kimberly 41:10
So that those neurons in that region, can form new connections. So it's generally that those, it's a rerouting, but in a similar area. So there's not there's not too much that happens once neurons have died.

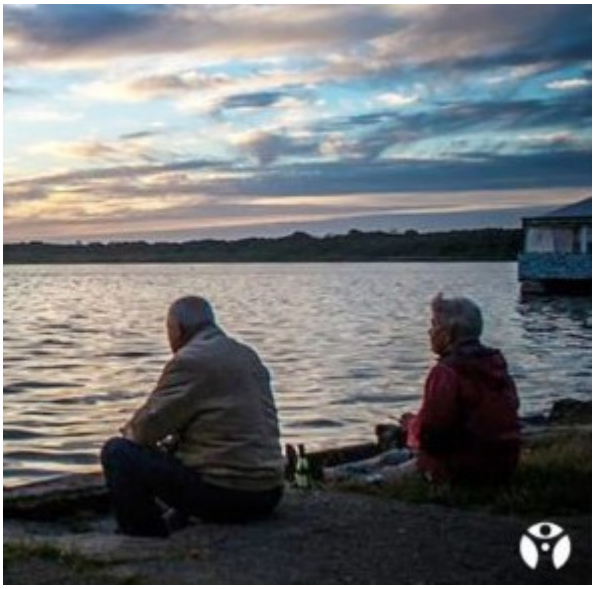
Kimberly 41:30
There's not much they can do there. But it's it's using the ones around that can reroute and if it's in a similar area they're similar types of neurons and they can take over the function of the other neurons that have died next to them.

Bill 41:45
I'm comfortable and feel good about the fact that my short-term memory is associated with my awareness of the task at the time and that if I've dropped my kids and I have been talking to my son at the same time, he's a conversation with me is what has potentially made me just forget where I left my keys if it's not in the same spot, it makes me feel a lot better.

Bill 42:09
We've spoken about explicit memories, something that is dramatic, like jumping into your potential Doom, of a bungee rope and having that bodily experience as well as an actual, you know, memory of something exciting and amazing and potentially crazy.

Bill 42:31
I don't know what and we're speaking about unconscious memories, memories that are the things that we are the types of memories of that there because it's a task that we've done over and over and over again and we just know how to do it.

Associated memories



Bill 42:48
You know, I when I'm sitting in my car, I'm driving away and a song comes on, that I haven't heard in forever and it reminds me of I hope my wife's not listening to that girl that I used to like back then. What kind of memory am I drawing on there?

Bill 43:08
Because there's a lot more going on than just remembering a song. But I'm also remembering a time and how it made me feel who I was with and what I couldn't say to her. What are we tapping into there? What kind of a memory is that? And why is it so full-on and so dramatic and so easy to fire that off?

Kimberly 43:31
I'm so, memories of particularly associated with strong emotions. And they get intuitive well. So it's kind of like an associative memory. So you have your memory of that event. And that's in the song in this case is like it's a trigger for that memory. It's like a key just say, oh, that memory. Remember that memory when you were looking at that girl you liked and I had that song playing?

Kimberly 44:07
Yeah, so it's that Association. We learn by associating things with each other. So when you had that initial memory of that song with the girl, they got coupled together, associated together. So when you heard part of that Association, the song, it also activated the girl, because they're being associated with each other.

Kimberly 44:32
And a lot of our memories are made through associations. So one of the classic

sort of experiments that they did back in the 60s when ethics wasn't a thing and they could, you know, scare babies and do lots of those sorts of funny associations that they got.

Kimberly 44:54
They got babies to associate with, I think was a was a white rabbit wasn't famous. Little bit experiment. And then they ended up just disliking anything white and fluffy pretty much. Yeah, so they kind of associated they taught him to associate a white rabbit with a negative.

Kimberly 45:14
I think they had quite a loud sound. So a lot of our memories are associative. We learn things together, and they get paired together. And then when one of them comes up later on, we remember all the other things that were associated with it.

Bill 45:32
Wow, that's good. Can we take advantage of those associated memories in occupational therapy in rehab to help that person today?

Kimberly 45:45
Yeah, I think so. Absolutely. Yeah. Yeah. They do a lot of the associative memory. So you can, you can use associations to learn new memories. So it can help with talking earlier about remembering names. If you meet someone at a party, and they've got the name of someone that you knew in primary school, you can make an association usually like this John had a John in primary school and find a similarity that they both have.

Kimberly 46:24
So perhaps they both have spiky hair, and you can be like, Oh, that's John's got the spiky hair like John from primary school and you make that association in your mind. So you're linking it to something already, that's in your minds.

Kimberly 46:37
It's already a memory that you have from many years ago. And you're meeting a new person that you're linking them to an old memory. That's going to make it a lot easier for you to find that new memory and to learn it to begin with. But also to find it when you next meet John, at a party and you're like oh, that's John cuz I've linked it to something I already You know.

Bill 47:01
That sounds like a memory trick.

Kimberly 47:03
Yes, absolutely. Yeah, these are things that you can use anyone can use but particularly following brain injury, it's a good thing to try and associate things with things that you already know all things that are meaningful to you.

Kimberly 47:20
So the more that you can link new information to something that you know already, or that that that has meaning has that emotional sort of aspect to it, the more you're going to be able to remember that information,

Bill 47:36
Emotional experiences are stored in different in different parts of the brain Is that kind of memory stored somewhere else or is that also stored where we find other regular memories?

Kimberly 47:47
So emotion is it forms part of the circuit Emotion is generally more in sort of that frontal is like a frontal region where emotions Sort of dealt with. And also the fear is, like I mentioned before was amygdala, but they form a circuit within so there's like a memory circuit.

Kimberly 48:11
And so that will go through the memory sections for that primary memory area in the hippocampus. But that also links up with the amygdala, it links up with the frontal cortex. So it makes this little pathway. So, as you went along you had the memory, but then the emotions also activated other than whether there was a specific motor component like bungee jumping.

Kimberly 48:40
That might also be activated in the memory. So whatever was occurring at the time with the memory will be encoded in a pathway? And when you recall the memory, that pathway is lit off again. So you remember all aspects of the memory,

Bill 48:58
Okay, so if that pathway is lit backward. It doesn't matter. So if, for example, I

can’t remember who I was at the bungee jumping with, but I was, but I bungee jumped and then I kind of take a backward path to who I was with is that how is that one way to kind of activate a more detailed part of a memory that perhaps has been missed or lost.

The memory of a memory?

Kimberly 49:24
It can be so memories are not exact recordings of what happens. But that’s one thing to note. So you might not have recorded that, to begin with, who you are with, maybe it wasn’t put in that memory choice. And as you recall, information each time that you recall, it is not the same pathway exactly.

Kimberly 49:47
It can get a little bit different. So we don’t recall events exactly as they happened. And we don’t recall them exactly as they were initially encoded each time that you recall it, it can change a little bit. So that’s why when you have expert witnesses in courts, it can often be a bit hairy because they might be remembering something differently from how it happened. When they saw the crime.

Bill 50:20
Yeah. So is it true that what you’re saying is true that what we remember is a memory of the memory?

Kimberly 50:26
Yes. Yes, exactly.

Kimberly 50:30
That’s for everyone. That’s brain injury specific to everyone. That’s our own experience and because we interpret things we don’t, we’re not recording it’s not like a video camera. recording everything we interpret we decide what’s important.

Kimberly 50:50
You know, what does that mean? How am I going to record that? We add on things sometimes, and the emotion can often change experience So we are active participants when we’re forming memories and we’re recalling them.

Bill 51:08

So sometimes we might even make the memory suit our particular needs. For example, In an argument with a lovely partner, we might say, but I don't remember that I remember it like this.

Kimberly 51:21
Yes, exactly. And both are true, you've got your version of the event. So it's a good one for next time you disagree.

Bill 51:34
I'm learning I'm learning. You know, in occupational therapy, in that time, where we're utilizing the physical tasks to trigger memories and to help the physical. What are we doing? Are we does the physical doing the physical task trigger the memory or can a discussion trigger the physical tasks Can we go backwards?

Bill 52:02
So what I'm saying is, do you remember when you used to pick up a ball Bill? Yeah, I do, How did you do that? I did it like this? Or is it better to say, Okay, Bill, here's a ball, and then just leave it at that and tell them to put the ball over there and let them pick it up and move the hand and do it? Are they two different parts of the same thing is one better than the other? Should we be doing one before the other?

Vanessa 52:27
I think that it could probably go both ways. Because with The first example that you gave, was like when you were saying that you were imagining yourself moving in a particular way. So what you would be doing if they said, do you remember how to do that you'd be reactivating those pathways and sort of visualizing yourself doing that.

Vanessa 52:47
And then you might be able to go over and you would follow those procedures that you've just mentioned, to go and pick up that ball. But I guess you could also be told Okay, just go and pick that up. But you'll probably go internally through those processes as well. Even if you weren't prompted, then you might still internally be going. Okay, so how am I going to go and pick up this ball? And you just think about that? yourself?

Bill 53:16
Right. So either way, what we're doing is we're somehow replaying the tape of in

the past when I've done this, this is how it's gone, or this is how the process has unfolded to the result. And whether you're triggering that by actually using words, or I'm triggering that by just trying to understand what you're asking, we're doing the same thing we are re, we're applying we're trying to apply what we've done before to the current situation.

Kimberly 53:50
I think that point also depends on what has occurred in the injury whether or not there's been some sort of physical injury to the hand, so not so much maybe on stroke patients but perhaps following a TBI, a traumatic brain injury, there might also be actual physical aspects of so the muscles themselves might be impacted at the local level.

Kimberly 54:19
So in that case, sort of just playing over the motor memory in, your mind's not going to help too much, you need to get the movement back. So saying the hand like actually physically moving the hand so that you're getting that muscle strength back. So there's there's the brain but there's also that the muscles that are controlling that movement at the local level, looking at both aspects.

Bill 54:46
Yeah, so if somebody is experiencing spasticity, they may know what to do. They may know how to do it, but they may not physically have the ability yet to stretch the fingers out and then all grasp Close the fingers clenched that the fingers and then squeeze on the ball to move it aside.

Kimberly 55:05
Yeah, exactly. Yes, I give them that opportunity to develop that motor (inaudible) getting that activation occurring at the muscle level.

Bill 55:21
Yeah. I remember when I was in rehab, I was sitting across one of my fellow patients, and he had him he plays up and I think it was his left side that was impacted as well. I can't remember maybe it was his right side.

Bill 55:36
And the way that he was talking to himself was real for me, As somebody who has coach training, I, amongst other things, coach people in their life to achieve things that they thought were not possible or they were struggling with.

Bill 55:53
So I'm in rehab and I've got my hand in a bucket of rice and I have to find the pin, lid and you know, the ball bearing and all these different things and I'm doing this you know, you know, searching around and trying to find these things and I'm hearing a guy, and I've done a presentation on this I'm hearing a guy I think his name was Ivan, that's the name I've given him.

Bill 56:18
His task was to get a toilet roll and move it from one side of his body to the other side of the body by closing his hand around it, and then just picking it up and moving it over. It was an empty toilet roll, there was no paper on the outside, it was just a roll. And when he was looking at his hand, he was saying, Come on, you bastard move.

Bill 56:38
And it wouldn't move the way that he wanted to. And he was looking at it saying it angrily he was saying move move and he wasn't being rude or anything but he was just talking perhaps as he would to a wooden post on his farm that he was trying to dislodge or something you know and I think said to him, the coach came out in me and I said to him, Ivan, you know if that hand did what you wanted it to do and moved the way that you wanted it to, and grab the toilet roll and put it down in place, what would it be?

Bill 57:15
And he said to me my friend, I said well that's sweet. So do me a favor. Why don't you call it your friend now and just see what happens? So, as he was going through that he was looking at me, but he didn't care what I was saying he was happy to indulge me.

Bill 57:32
He goes, okay friend move. And you wouldn't believe it. As soon as he said that. With his limited motion, he moved his fingers, grasped the toilet roll, moved it over, and put it on the side that it was supposed to be without it falling over.

Bill 57:48
It took I'm not sure whether it was like even a second for him to just go from the previous experience to the new experience and get that thing achieved. And then he was extremely excited. And really, just everyone was going wow, whoo,

everyone was freaking out around the table.

Bill 58:07
There are probably about 10 people around there, including occupational therapists and other patients. What was different? The words were, but what do what can you explain about what was different between his calling his hand the bastard, and then when he was calling his hand a friend to make that dramatic improvement in his motion and his range of movement?

Kimberly 58:37
So from a psychological point of view, we know that the way we think about things can impact our behavior. So often, if we're thinking that negative things going to happen, it's an unconscious thing, but we can sort of bring about the negative things through our thinking the negative things so in our mind perhaps he's already saying in his mind that he can't do it.

Kimberly 59:05
He's playing it already and said You can't that Like my hands like can't move it I'm not going to be able to do that. And then when he goes to penitence to do it, he can't do it. So just changing that belief sometimes can help,

Kimberly 59:23
You know visualize, if he visualizes that he can do it, that might just hope that just activating that, pathway a little bit better, rather than anticipating or even imagining that, he wouldn't be able to do that. So sometimes the mindset it's quite crazy in that way that it can impact how we behave and what we're able to achieve.

Kimberly 59:51
Sometimes if we just have that little belief, and we have that bit of imagination, to picture it, then When can bring about some more change? That's not to say that, you know, you're in a wheelchair and you just picture yourself walking, that's going to happen.

Kimberly 1:00:09
But just having that little bit of belief that you can or that you might be able to do something a little bit more than you're able to do now can often help.

Bill 1:00:20

Yeah, I was just curious, I wanted to know, like, I want to know those things from you. I wanted to know from him what would happen, and I couldn't believe what I saw, because I'd never, coached somebody, you know, back in 2014 in that space where they were healing from physical challenges related to an injury, especially from a stroke.

Bill 1:00:43
So when I said it to him, and he just did it, we got that result and I was just stunned and I realized that what also was happening was that the way that he was because I then tried it on myself, I used those words to describe My arm.

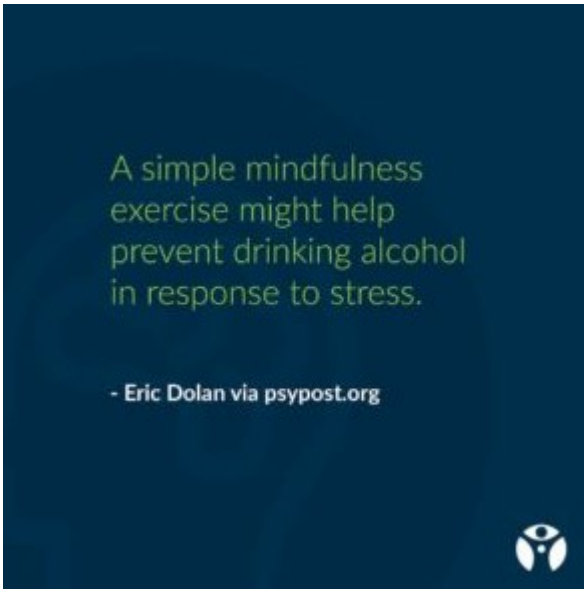
Bill 1:01:01
And when I did that, what I noticed was that I became more tense, the muscles contracted differently, and released differently and so did my fingers. And then, when I was nice to myself, everything changed, my whole physiology changed, and therefore my muscles moved differently, and therefore my arm opened and contracted differently.

Bill 1:01:21
So I had an amazing learning. I learned so much from that experience, that's such a small experience. And that's kind of been what's motivated me with my recovery and he wasn't walking so I didn't set my life and call myself a friend that didn't get up off your wheelchair.

Bill 1:01:40
You know, that didn't happen. But I would like to think that that lesson taught him later on when he was able to regain the use of his arm and start walking again. He hopefully applied the same thing to his leg and then maybe got some results that he didn't, that maybe at the beginning, he was unsure whether he'd be able to get again you know, because of what he had been through.

Bill 1:02:10
So I found that fascinating. Now, as we come to wrap up, I want to touch on the topic of alcohol. So in the first couple of years after brain injury, the National Stroke Foundation in Australia says that you should avoid alcohol. And I read that at some point. And I think the recommendation is for at least a couple of years, and I did for five years I avoided alcohol for five years.

How alcohol affects the brain



Bill 1:02:43
Every time I drank something, it made me feel like I was having a stroke again and even today if I drink more than about half a standard drink, I still feel like I'm having another stroke so it's not a nice feeling. So when people are recovering, I suppose the question is, you know, when we talk about I've had way too much to drink.

Bill 1:03:08
I think I'm killing some brain cells or killed some brain cells last night or I don't remember what I did last night. Are we interfering with our memory in that we are removing memory pathways or what is happening when we drink alcohol to our memory, and we can't remember what we did last night?

Kimberly 1:03:30
And so it's a bit of a fallacy that alcohol kills brain cells. So they've done a lot of research in the past years looking at, they used to think that alcohol cause dementia. And they did a lot of research looking at this and they found that it's not the alcohol that leads to what they call when you (inaudible) which is the dementia that they associated with alcohol.

Kimberly 1:04:01
That is not the alcohol itself that was causing the damage, but rather a thiamine deficiency. And thiamine is B1, vitamin B1. So alcohol has impacts on our gut. So it stops us from being able to absorb things properly. One of which is vitamin B1 which has really important impacts on the brain.

Kimberly 1:04:32
It’s very important. B1 is really important for the brain. So that’s kind of what they found in the research is that it’s not the alcohol itself. It’s an indirect effect through depleting the b1, our brains, that causes the neurons to be damaged.

Kimberly 1:04:53
So it’s not alcohol per se, alcohol does have other impacts, obviously in the gut in absorption of different vitamins that we need. So when you go out and have a big night and you drink way too much, and the next morning, you’re not able to remember it’s not that memories are lost, they weren’t there to begin with it’s very hard to lay down new memories because you’re not paying attention.

Kimberly 1:05:25
You’re off doing quite silly things, your reasoning is not there, and your brain not functioning the best when you’re taking alcohol. So it’s, it’s not that you’re forgetting memories, it’s just you’re not putting them down to begin with, they’re not getting stored to begin with. So it’s it’s not impacting the memory and that it’s taking away a memory that was already there, or that it’s killing off neurons that were storing a memory.

Bill 1:05:53
Wow. That’s fascinating to know, that actually, alcohol impacts the gut directly and therefore that issue that it’s doing in the thing that it’s causing in the gut is directly impacting the brain.

Kimberly 1:06:05
Yeah, so it works through that way but also works. Particularly if you’re drinking a lot of alcohol, you tend to eat a lot less, because there are a lot of calories and alcohol, You get a lot of nutrients from the nutrients really, but the energy to sustain yourself so most people are drinking a lot of alcohol will not be eating particularly well.

Kimberly 1:06:33
And you can see vitamin deficiency in other areas as well. So people who have diabetes sometimes if you’re not managing their diet, well, you can find vitamin deficiency in that sense as well. So it’s kind of the two prong so it’s, it’s in the gut, the alcohols not helping with the absorption, and also that they’re drinking so much alcohol that they’re not eating a proper diet. Not getting their B1 through a

normal diet.

Bill 1:07:05
So this is me just thinking out loud, but you just triggered something. So I've, you know, read a lot of books that suggest that Alzheimer's or dementia, I think it's Alzheimer's is type three diabetes is starting to be spoken about as type three diabetes. So it's interesting that you said that people who are experiencing diabetes who are who have diabetes, or imagine it's type two diabetes will therefore have a thymine deficiency.

Kimberly 1:07:39
It's not necessarily it can be seen. It depends on how they manage their diet. So if they're managing their diet well, then they bonded, right? If they're not managing it so well, they can have that be one deficiency,

Bill 1:07:54
Right? And then as a result of that, the greater risk of developing a neurological condition like dementia.

Kimberly 1:08:01
Yes, if it's very prolonged it's been, you know, sort of months, two years that they've been having a poor diet, and it can lead to cell death in the brain. But it's, it's one of those things where you if you start replenishing the B1, quite soon after, after recognizing that there's a deficiency then it can be, you can gain some of that back.

Kimberly 1:08:35
So it's it's not dementia in the traditional sense where usually in dementia, it's a it's a progressive, it's a progressive loss of neurons and there's no there's no way of recovering that function. So it's, it's, they used to call it dementia but it's not referred to as dementia anymore.

Bill 1:09:00
Okay, interesting. So we might be going down another rabbit hole, and we are coming to the end of the episode. So if this is a rabbit hole for another episode, then that's fine. But can I quickly just touch on the facts or studies suggest I've read some literature about the possibility that people who experience a brain injury are at greater risk of dementia later on in their lives? Is that something that you guys have heard about?

Vanessa 1:09:34
I've heard of that about concussions. So mainly from the sense that if you have multiple concussions, for instance, people who are playing high-impact sports, there are repeated tears in the brain and then that can impact memory later on. At this stage, I'm not entirely sure why that, you know, is the relationship but I have heard that.

Kimberly 1:10:05
They're doing a lot of research in this area because it's a hot topic at the moment out there, particularly in the sports field. The research today is saying that as long as in particular concussion, as long as the concussion is well managed too, you're not letting a child who's just knocked his head and had a concussion go out on the field Five minutes later, that you're taking him to the hospital that you didn't risk that you're allowing an appropriate amount of time for him to recover.

Kimberly 1:10:42
So as long as those events have been managed well, there's not so much evidence at the moment, at least, that that multiple, sort of like two or three, perhaps if you had, you know, 10 or more, there might be more in that respect. The evidence at the moment mainly suggests that as long as they are well managed, following a concussion the risk of getting dementia later on is not too great, as opposed to the general population.

Bill 1:11:17
That's perfect. On that note, I want to thank you both for being on the podcast. I appreciate it. And I hope I can make you guys the people that I can just call on whenever I want to ask something that's related to psychology, brain neuropsychology, or occupational therapy.

Kimberly 1:11:35
Yeah, absolutely. You've given us some great thoughts as well and things that we're going to go off and look into. Yeah, absolutely.

Bill 1:11:44
Yeah, thanks so much. Enjoy the rest of the day.

Intro 1:11:47
Discover how to support your recovery after the strike. Go to recoveryafterstroke.com