

# Neuroplasticity After Stroke - David Norris

David Norris is an Occupational therapist from Brisbane, Australia who specializes in the brain's neuroplasticity to help people recover better from a brain injury.

Website: [occupationaltherapybrisbane.com.au](http://occupationaltherapybrisbane.com.au)

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David 0:00

The other element to consider in triggering neuroplasticity is creating conditions for a novel or new things which are novel and new, help us to bring our skills today, and challenge us to create a unique scenario we have to adapt our neurons are firing often at the network and hang on. How do we do with this, it might take you a little bit longer, it might take you a little bit more it might increase that level of challenge for you. But that newness and novelty are important and you might repeat and repeat that until it doesn't feel new and novel anymore.

Intro 0:45

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

Bill 0:54

Bill from [recoveryafterstroke.com](http://recoveryafterstroke.com) This is Episode 86 and my guest today from Occupational Therapy Brisbane is David Norris. David was also a guest on episode 76, where we discussed some of the things that you can do to improve your fatigue symptoms. Now just before I get started, I wanted to let you know that you can now download all the words of this episode as a PDF.

Bill 1:20

It's perfect if you prefer to read and take notes that will highlight different parts of the interview for future reference. It's a great way to learn and helps retain new information in memory. Just go to [recoveryafterstroke.com](http://recoveryafterstroke.com) and click on the image of the episode you have just listened to. At the very beginning of the page, you will see a button that says Download transcript.

Bill 1:43

Click the button Enter your email address and the PDF will begin downloading. Also a few weeks ago I launched recovery after stroke coaching. The people who have signed up and are being coached by me and being helped to overcome challenges including fatigue, anger, and isolation amongst other things. So if you're a stroke survivor who wants to know how to heal your brain, overcome fatigue, and reduce anxiety.

Bill 2:07

Recovery after stroke coaching might be perfect for you. If you have fallen in the cracks between hospital and home care, and desire to gain momentum in your recovery, but 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 2:25

I will help you create a picture of where 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 2:47

If you take up this offer, you will get a one-on-one coaching thread with me and access to the course 10 Steps to Brain Health for Stroke Survivors when released.

Member access I the monthly group training calls and access to the strong Survivors private forum. Be one of the first 10 people who joined recovery after show coaching now and get the first seven days free. To get recovery after stroke coaching, click the link below if you're watching on YouTube, or go to [recoveryafterstroke.com](http://recoveryafterstroke.com) if you're listening online, and now it's on with the show.

Bill 3:19

David Norris from Occupational Therapy Brisbane, welcome to the podcast.

David 3:24

Thanks very much, Bill for having me.

Bill 3:27

You're welcome, mate. We traveled some distance of about 1000 kilometers each time to meet in the middle of Sydney from Melbourne you are from Brisbane, where when we did meet, we had an amazing chat about the kind of work that you do in the space that I'm working in. And I thought it'd be a great opportunity to get together and share some of the stuff that you know, about helping people heal especially since you're a professional occupational therapist.

Bill 3:54

And my community is always looking for tips and tricks and ways to heal. So some of the work that I've been doing in the past is contacting people from all over the world, including professionals, neuroscientists, and researchers. And a little while ago on episode 27, I contacted Dr. Michael Merzenich, who's considered to be the godfather of neuroplasticity, and he's been researching the field since the 90s, or even mid to late 80s.

Bill 4:24

But during that interview, I've got to say I was a little bit starstruck. And I didn't ask many questions about the detail that people need to know about neuroplasticity on what it is. I really only asked him about him, but it was still a great interview and still shared some insights into that. I'm so excited today because we're going to dive a little bit deeper into what neural plasticity is, but before we do that, can you tell me a little bit about what it is that you do?

## About David Norris



David 4:56

No doubt I can appreciate why you were starstruck with Dr. Michael he is a walking Tomb of knowledge in neuroplasticity and by no stretch of my imagination do wave and compare to his in-depth knowledge around the machinations of neuroplasticity, however, he has set a trial that many neuroscientists have gone.

David 5:20

And he's also proved to be invaluable and I guess, representative of a collective group of people that have brought more understanding around the workings of the brain and had to work with it to get a good outcome or work towards an outcome for a client and that's where I've perhaps picked up the baton from the neuroscientists of the world and their ongoing research into neuroplasticity is then bringing that content that knowledge into an architecture around the recovery process after a stroke. And I'm excited to Be able to talk to your audience about that today.

Bill 6:02

I never understood the, need for neuroplasticity until I needed neuroplasticity. And I suppose some of the people listening and watching will be wondering, what is neuroplasticity, why do I need it I suppose that's a really good place to start the conversation. Why do we need to know about neuroplasticity?

## What is neuroplasticity

David 6:31

Maybe it's an experience that as an OT, when I started working my private practice, one of my first clients that I had come to me was a gentleman who had survived a stroke. And as a very large, dense stroke. That's probably a term that you've heard before. Dense stroke has quite a pervasive effect on not only our cognition, how we're thinking, and language expression, but also on a movement in sensory experience as well.

David 7:00

He had one that affected the right side of his body. He came to me six years after his stroke. For the first six or so years, his primary focus was really on movement, being able to walk again, being able to move from bent, from a sitting position, or standing position to be able to get into the shower area and do the things that he needed to do.

David 7:25

But it almost happened at the detriment of his upper limb performance. And so when, he reached out to me, one of the first few things that I try and identify with focus, is what are we working towards, and I want to make it very practical, very goal orientated about what it is that you want to do. Now, of course, I wish I had a magic wand and that magic wand enabled me to say, look, yes, in six months we're going to get full recovery.

David 7:57

I as an occupational therapist am working towards what is it really important for you because life has changed dramatically. What could be the outcome that we could aim for? And if so, what would you like to be able to do? And for this chap, he wouldn't hold a Corona and be able to drink from the stubby as he watched the State of Origin football game between Queensland, and New South Wales now, for many people outside of Australia that probably is equivalent to sitting down and enjoying cold icy beverage during the Super Bowl or maybe a great soccer game in the UK.

David 8:37

But for this gentleman, it was very much a statement of purpose recovery and being you know, he wanted to achieve them. So, over 12 months after having significant movement deprivation, I have not learned how to use his arm for a long time, he couldn't turn a light on. he couldn't operate the lifts in his building, he couldn't open and draw with his most dominant hand and his right hand.

David 9:13

Throughout the 12 months, we step by step, can achieve those things to the point where he can go to a social occasion with his partner, reach out with his right hand, and shake that person's hand comfortably. We've got there in the end, got him to be able to drink a Corona. Now, I guess I think that's a really powerful example of how the brain's plasticity and that's not to say that the brain is plastic.

David 9:49

The plasticity in that term refers to that it's bendable, it's flexible. Its flexibility. It's changeability. It changed. It has the capacity, the brain can change its structure, function, and organization of neurons in response to the environment in response to the experiences you put in front of it.

David 10:16

So, when you think about that gentleman's journey and his stroke recovery, he didn't put many experiences in front of his upper limb use, to encourage him to explore it to reveal the possibilities to challenge it to lunge it, and hence, neuroplasticity in that context had a darker side. It didn't adapt. It shrunk. It reduced its connectivity. It became weaker. The other side became more dominant.

Bill 10:52

Awesome. We're going to explore that a little bit deeper. But do you have an idea about why he didn't pursue that opportunity to rehabilitate his arm or to retrain his arm? So what happened?

David 11:17

I think that's a very complex question because each person is going to have perhaps different factors. But if I can map out a couple of the key things that I saw one was that it's a term that often throughout quite often when I'm teaching folk about these concepts about brain health and neuroplasticity, the task determines the team. And for him, the task was, I wanted to walk. I want to be able to be mobile.

David 11:50

And so the team around that was very much his physiotherapist who had strong skills in low limb function, mobility, walking that perhaps though, meant that the doors that were opening were only in regards to looking at the lower limb looking at trunk movement, looking at his leg strength. But for that chap, he knew as

much as he knew, and he was reliant on his team around him to identify those areas to support and lunge in alone.

David 12:26

Sometimes, you know, in my experience in observing folk particularly, you know, somebody who's experienced such a significant stroke like that, the pathway is very much set up in that rehab, acute early phase about what is possible and is not possible. And for those wonderful and skilled therapists working in that space, they're working with people very early on in their journey, and don't get to see the full opportunity in front of people over time.

David 12:58

I was very, very lucky to work with that gentleman and since then I've worked with many people, stroke survivors who are asking questions of themselves about what can do. What is the limit of my potential here? And I think one of the most fabulous discoveries in neuroscience has been the unmasking and unveiling of what neuroplasticity can afford us.

David 13:24

And then importantly, what are the leavers to make neuroplasticity work for us? So, I think in part there was a goal, his team around him was focused on that goal. However, we aren't raising the possibilities of what else could we be doing? in some people's experience of stroke, there is an impact on our awareness of our body.

David 13:52

In this chap instance, that wasn't so much the case and we might call that a neglect or a partial neglect and ability or inability to be aware of that part of my body. And that in itself raises its flags pretty early in somebody who's recovering. But in this gentleman's instance, that wasn't the case. They may have tried early, a couple of activities, and maybe when a successful didn't see the immediate results that they were achieving with low limb ability, and therefore they went, you know, what his mind limited resource energy time headspace that I can allocate towards this, I'm going to have a crack at just working on my mobility, they could be some of the factors that were certainly influencing his recovery.

Bill 14:40

I think that's an awesome answer. Because when I interview people, often what I

get from them is that they do say that, you know, they may be 10 or 20 years down the track, and they have regained a lot of abilities that were lost, perhaps, and then there was this one thing that they didn't get back or this one thing that they weren't able to improve on.

Bill 15:09

So they identified clearly that it was most likely a scenario of focus in one area. And then once that area got up and running, and they got busy, or they got distracted by other parts of life, that this little thing or whatever it was just sort of slipped into the periphery and wasn't something in that person's awareness. And an interview like this would have triggered in their mind. Oh, I'm somebody who has put all my recovery resources into using my arm, for example, and my leg is, not the best. It's not what it could be or my gait is not the best or I'm not putting my foot properly on the ground.

Bill 15:55

So that's a pretty good example of how it is that people just get distracted from everything else that needs to be done or everything else that needs to be supported. So I know that when I was in rehab as well, David, the occupational therapists, and, other therapists who asked me specifically what I wanted to achieve, helped me achieve that.

## **Hospital rehab limits**

Bill 16:24

But we only had a limited window in which we could operate because I was booked into rehabilitation for a certain amount of time. And then it was time to go. So once we achieved that outcome, they kind of looked at me and said, okay, we've done that. Now we're at the end of rehabilitation. They didn't ask me what else they could support me with because they didn't have any more time with me and I had to leave.

David 16:52

I think we've raised a couple of really important points that Bill about sometimes they're referred to almost like seasons in recovery, that for this season that I'm in or that person's in, the priority for me is blah. That might be a work priority. That might be a memory priority. That might be a movement priority, whatever it is for that particular person.



David 17:19

But they said, Look, my life's busy. I want to live my life. I don't want to be in a life where I'm in rehab all the time. Like I'm not rehabbing when I'm in my kitchen. I'm not rehabbing when I'm going down the stairs at the front of my house. I'm not rehabbing when I'm playing with my kids or grandkids. I just want to be me and enjoy that moment. And I think we need to have a sense of forgiveness for ourselves when we are going through this because if we can do one thing well, we've nailed it.

David 17:55

We're going to get good results. We're going to put a lot of tension and focus somewhere our focus goes, energy flows. And we're going to get the adaptive change. And I think it's important to recognize that once we've gone through the washing machine and hospital acute rehab day hospital spent at the back end, and you're thinking, now what? I've got life, life's busy.

David 18:19

I've got some commitments. I'm trying to pull all that together, what can I do, I still want to keep going on this pathway. Having a cast of thousands of different rehab professionals around them can make it hard. So I want to say that coming up with a plan though, and having a long game view that I'm in this phase right now and these are my targets and goals, and once I've hit that this is my next priority for me, is a nice way to approach it. I think that's probably worth mentioning is that it's quite, you know, think about it as seasons because we're going to put the long game.

Bill 19:00

I like that I was overwhelmed by the number of rehabilitation days and appointments I had after I was discharged. So we did a little bit of outpatient rehab, and sometimes three or four times a week on different days, I would have to go to rehab. It was extremely difficult but I did get to the point where people listening who have been through something similar might see the similarity. I didn't get to the point where I thought, I cannot be bothered with this anymore.

Bill 19:32

And I'm going to take the rehabilitation stage now. I'm going to take that responsibility home with me and I'm going to do what I can on my own. At that time, if I did get busy with family life with work whatever it was then

rehabilitation did take a backseat. Something that I needed to stop doing for a little while while I did my daily tasks I tried to make a living. So I get that. And that's a really good way for people to understand why they may be 20 years down the track and all of a sudden forgotten that there was this other little part of them that would have been great to rehabilitate.

David 20:17

You mentioned another point earlier too about in the hospital that you've had a very brief amount of time with therapists and then all sudden it stops. One of the main factors around neuroplasticity is making sure that much like going to the gym, if you want to get that muscle bulk change in your body, if you want to get that athletic lean element to you, or if you've got some goals around strength, you've got to put in the reps.

David 20:44

You've got to put in that sort of volume. And for many folks, they don't get that exposure. And that exposure will follow them not only in the acute setting, but even into the rehab environment where you might only have maybe one hour of contact with a therapist now there are a couple of variables that can affect that particularly people's experience of fatigue after in the early days of their recovery, but it's also about trying to get those reps in.

## **Repetition is crucial to neuroplasticity**



David 21:11

Repetition, repetition, repetition. Now, that's one of the factors, and a secret sauce, I guess, around your plasticity, and I guess we can talk about that a little bit more. If you'd like to think it's worth it when we talk about neuroplasticity. It's like coming to it from how we drive our car. I certainly don't understand how my car works. Other than putting fuel when there's a spark as a chemical reaction it drives the pistons they do their sensitive thing. It's gas exchange and byproduct

and spin at the back end.

David 21:52

There are a couple of accelerated things around the big batteries that won't hurt oil. Yep, turn on probably showing the depth of my knowledge. And how my car works. I do know that when it stops or doesn't work, I go through a bit of a safety check. I know that there are a couple of things I need to check on to make sure it runs well.

David 22:11

But I guess that's probably a nice point to think about how neuroplasticity in our brain, our brains divided into two hemispheres. It's got working units called neurons. They're the guys that provide the electrical signals and allow us to get networks happening and they communicate with each other and find neurotransmitters. You would have heard of neurotransmitters dopamine, serotonin, glutamate, GABA, etc. And then we've got receptors and these receptors sit on the neuron cells, and they are like little gates that trigger a certain behavior.

Intro 22:56

If you've had a stroke, and you're in recovery, you'll know what a scary and confusing time it can be, you're likely to have a lot of questions going through your mind. Like, how long will it take to recover? Will I recover? What things should I avoid In case I make matters worse? Doctors will explain things. But, because you've never had a stroke before, you probably don't know what questions to ask.

Intro 23:21

If this is you, you may miss out on doing things that could help speed up your recovery. If you're finding yourself in that situation, stop worrying, and head to [recoveryafterstroke.com](http://recoveryafterstroke.com), where you can download a guide that will help you. It's called seven questions to ask your doctor about your stroke.

Intro 23:40

These seven questions are the ones Bill wished he'd asked when he was recovering from a stroke. They'll not only help you better understand your condition. They'll help you take a more active role in your recovery. head to the website now, [recoveryafterstroke.com](http://recoveryafterstroke.com) and download the guide. It's free.

David 24:10

Neurons clustered together in groups and they also reach out to other areas of the brain and form networks. When the stroke happens, we can get death in those neurons. Those connections in the local area and also the communications to other areas of the brain or body are affected by their ability to create neurotransmitters.

David 24:35

So, that's essentially at a very gross level. Some of the elements associated with our brain's function and neuroplasticity are working at that cellular level we can either grow new x own or connections, we can prune them back or trim them up, and can weaken or strengthen them.

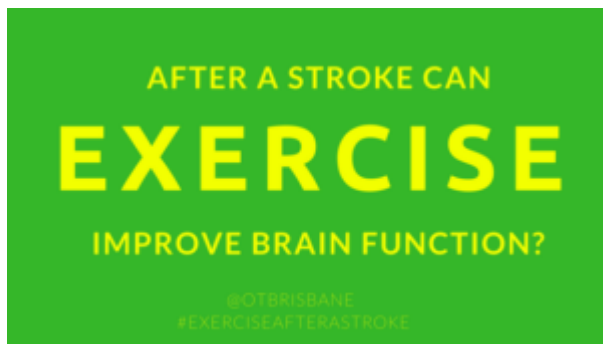
David 25:06

And that allows us to adapt, change, reacquire sharpen our skills. And we want to try and trigger that as much as possible. And when we look at those activities that we can do to help those few pathways where we've lost a function in an area, what in that neighborhood can acquire those skills? Now, certainly the the severity and impact of a stroke and the size and scale of it will have an impact on our capacity of what we will regain, and what that will look like.

David 25:54

Now I wish I had a crystal ball to give people a clear view of what that trajectory Looks like but it can be very individual. The factors that influence that, again about obviously, this type of stroke, what we eat, how we sleep, how our heart health is, how, much we have in connection with purpose, and how much love and support we have around us. These are all factors that are going to influence our trajectory. And I guess we can dive in a little bit and talk about what are those ingredients in neuroplasticity if you'd like Bill?

## **Negative neuroplasticity**



Bill 26:33

Yeah, we'll do that in a little bit. So earlier, you spoke about neuroplasticity. You spoke about it in a positive light in that we can connect your neuronal structures can grow them, and then you spoke about pruning them and guess losing them. So people have heard about neuroplasticity, and there is there seems to be a feeling that it's only a positive thing. But it is also possible to have negative neuroplasticity, to unlearn behaviors, and to change the brain in a way that doesn't serve us. Can you shed some light on the opposite of positive neuroplasticity, which is that pruning aspect that you mentioned?

David 27:21

Maybe just to tease that point a little bit more. neuroplasticity helps us adapt, grow new connections, strengthen connections, and weaken connections, which in itself can have a positive outcome or a negative outcome. The pruning can be a very positive thing. We want to inhibit certain behaviors we want to refine certain skills which means that we get we have less noise around that communication between neurons by retracting and pruning. Getting clarity in that direct signaling. So neuroplasticity itself is about strengthening connections, weakening connections, growing new connections,

David 28:14

The outcome can be positive, or it can be negative. And that's when we talk about the light or dark aspects. Well, I think I could almost coin it around the Star Wars analogy. There's a light and a dark side. In regards to the dark side, it is the negative adaptive features now, if we think about that.

David 28:41

I'm reaching for a cup for example. I'll pull up my water bottle here and speak at the same time. Can you see that there Bill? Okay, I'm going to reach for that water bottle. Now as I reach for it. Now, this is my right side let's say it's my effective side. I use a lot of excessive movements to reach and grasp. Why not at

the same time I have a higher or increased excitability on the other side where this hand my left hand starts to rise at the same time.

David 29:12

I guess what's happening at that time is that I'm getting a change and excitation on the other side, which is being paired with that movement where I'm getting over movements. That shouldn't be. You could say that's a negative, maladaptive strategy. I would like to have that as one side working without the other side kicking in as an overreaction if it's not needed.

David 29:37

We can talk about mood elements such as depression, as being a maladaptive strategy where we've had negative elements a negative outcome of neuroplasticity, being that we're being tracked in that sort of darker, negative worldview. Elements and neuroplasticity can support Working on these negative behaviors, habits, and thoughts.

Bill 30:04

So, is it like when one of the hands is affected by stroke, and it's harder to use the affected hand, we stop using it and we swap and we use the other hand? And then as a result of that we are pruning or making connections of the affected hand weaker. Because we've stopped using that.

David 30:28

Correct that's a negative consequence of neuroplasticity, neuroplasticity is positive, negative, and neutral, it doesn't care. It's going to do what it does, depending on the stimuli that you give it. So that the outcome is less movement outcome is negative thoughts, the outcomes are nonmeaningful habits. I guess you could call them the dark side of neuroplasticity.

David 31:01

So when we are looking at recovery from a stroke, we want to strengthen growth skills that contribute to a functional life. We want to harness that beautiful potential of our brain in a way that continues to support and development of skills and re-acquisition of skills, cognition, memory skills, problem-solving skills, all the things that our brain does for us.

# Positive neuroplasticity

Bill 31:31

So how do we do positive? The positive version of neuroplasticity? How do we do the one that is going to support our outcome in a well-lived life in a life that allows us to be ourselves to do the things that we want to do to interact with our children to tie the ponytail in the back of our daughter's hair to tie our shoelaces. How do we do positive neuroplasticity I'm sorry if that's not the right terminology, but that's kind of how it feels to me that we need to do the better version, the lighter version of neuroplasticity and not the darker version.

David 32:10

Yeah. Neuroplasticity does not care whether it is a positive or negative outcome, it still will be neuroplasticity. When we want a positive outcome, you've hit the nail on the head is stating all those things, tie the ponytail on our children's hair or grandchildren's hair. Get my shirt on and do my buttons by myself without having to have help from my partner.

David 32:44

To be able to get my words out clearly and smoothly without having to get stuck trying to find them or get words incorrectly placed. All those things are in front of us and I guess the most important thing, particularly as a therapist when I'm working with people, and we mentioned this right up at the front of our conversation, which is having a meaningful goal.

David 33:10

It keeps us focused and aligns our energy and attention to the skills we want to acquire. If we keep that vigilance on that, and it may be a huge goal like that chat with drinking a Corona, it was huge. That was like climbing Everest. To get from where it was to that was massive,

Bill 33:35

Because that means that his with his friends, he's able to have a social experience he's able to celebrate he's able to have a bit of a drink. That's an amazing thing to be able to be with your friends and do that. It feels like, you know, you're back to a really good normal space.

David 33:53

I'm feeling human, I'm feeling valued, I'm feeling like I can do this. I've got hope. Not marginalized. I'm not marginalizing myself, because I feel I can't. I'm not hiding in myself. All those things that people experience can reduce and shrink our world. When we have our focus on a goal it helps us map out what are the steps to get there, and there might be many milestones to get to that goal. And for that chap, we just got our first goal was trying to hit the button on the lift.

David 34:32

And it was halfway getting the arm up. But we're halfway there. So, you know, it starts with those things. So what do we need to do that? Well, we need to set up a program to simulate those skills we need to put in daily activities that are going to challenge that. And I guess this is coming now down to when we want to have a positive outcome from neuroplasticity we've got to work on those positive outcomes we desire.

David 35:03

If we are slipping into those negative elements that aren't pro-life participation pro, I feel good about myself. Then they're going to cause a change in our brain to take them in the way. Now personality changes in a huge one. So it can happen post-stroke, working on those things that we want to cultivate. Well, I've got to go after that, like a terrier after a rat. You know, it's got to be that persistent.

Bill 35:36

Now I remember after my initial rehabilitation, which lasted for a month, and then when I was at outpatient rehab, which was three times a week for about six months. One of the questions that my occupational therapist asked was, what else do you want to do? So of course, I wanted to get home I wanted to get back to work. I wanted to do all that stuff that was all the standard usual things.

Bill 35:59

That was what I didn't realize I wanted to do I didn't realize that I wanted to run again. Now, if you look at me, people looking at me won't be able to tell that I've had a stroke and that I have deficits. But when it comes to running, I can't run. I can't run because the way the muscles tense on the left side makes it difficult for my knee. When my foot lands, it makes it difficult.

Bill 36:28

And I became afraid of running and I became concerned about running. And when



they asked me what I wanted to do, I didn't say running a marathon or anything like that, I just said, I'd like to be able to run across the road in case there's a car coming. When I was getting to my, you know, my office or somebody's house, or wherever I was going, you know, and that was interesting.

Bill 36:51

So it sounds like what you're saying is that's the type of thing because if I wasn't able to cross the road confidently, I wasn't able to run across the road. To get away from a car, I would feel it would be extremely difficult for me to go anywhere and do anything, I wouldn't feel good about myself crossing the road, and I wouldn't be confident about it. I'd have anxiety about it, and it would negatively impact my life.

Bill 37:16

So when I discovered that my real issue was, in my mind, I thought that I couldn't do a running motion. And of course, my occupational therapist took me through the process to prove to me that I was doing a running motion, even though it didn't feel correct because my knee doesn't feel supported. And my muscles are responding differently these days. They still proved it to me by videoing how I was running and saying to me, look at you, you are running.

Bill 37:49

So then the focus was turned on. Forget about the negative reasons why I hadn't run in six months, and then start focusing on how I can run, even if it is slightly off, and I'm not doing the proper perfect running motion, I am still able to move faster off of the road than a walk. And then I've considered myself running. Now I don't play sports, I can't run in that fashion and play sports or that type of thing. Well, I feel confident about getting out of the car and crossing the road and being safe in that environment.

David 38:26

And the thing with your running analogy is that you decided that was important for you. Had real-world elements to it, it was in your reality that was meaningful for you. And so, if I was to probably unpack the steps for what you do through that process, it would have required repetition.

David 38:48

You would have done something frequently about doing that running element or

the precursors or things before the run. What are the essential things well on a good bottom stretch Bottom muscles, you know my glutes, I needed to have good hamstring coordination. I need to have a good reasonable core. I needed to have a good sensation. All right, tick, tick, tick. We've got those things. Now let's simulate something that starts that process where are you at?

David 39:15

Well, I can't run across rows that have uneven territory. Fair enough. We'll do it on a treadmill. We'll start here. Then we might add in some novelty you might get you're doing some balance boards and things like that we increase the effort and challenge. the evident challenge needs to be there was sort of effort that we're after when we're doing anything to try and shunt neuroplasticity or get it working.

David 39:40

Needs to be earned a sense of six to eight out of 10 levels of effort. So 10 or 10 is the most challenging thing you've ever done. Zero to 10. Not much, no effort at all. We want to be in that zone around six to eight out of 10 personally for you, not for me, not for the therapist. Standing next to you, not for your loved one saying you're not trying hard enough for you, it needs to be fixed eight out of 10. Like I'm really Yep, I'm in that zone.

David 40:10

You need to be doing it for a period long enough. And now in the early phase, you might find exhaustion kicks in. And so something that started as a six out of 10 quickly becomes a 10 out of 10. Well, that's when you pull up stumps and you stop. However, over time, you'll find that you're able to sustain that six out of 10 to eight at the 10 level of effort for longer.

David 40:36

And for some time, if you're hitting it for 20 to 30 minutes, and it's a six, two out of 10 it's getting easier. Well, guess what we need to make it harder. So it needs to be evolving in its challenge. Much like going up a set of stairs, we go up may make sure that we're hitting that plateau, and then we go up again. And we're continually evolving our level of effort because if I asked you Bill when you first started your return to running. And that level of effort was a six to eight out of 10. What you're doing at the beginning to where you are now? Would it be a six out of 10 anymore? No, it's much less.

Bill 41:13

Firstly was walking on a line that was drawn on a ground on ground surface. And then the steps were added a little later. So the course became a bit longer than it was one step and then it was two steps then it was three steps and so on. So it did evolve and change now that you say it was a very gentle introduction, and then a little bit more challenging towards the end of that month of initial rehabilitation, and then we followed a similar pattern to the outpatient rehabilitation which happened over six months.

## How to trigger neuroplasticity



David 41:47

Okay. The other element to consider is whether triggering neuroplasticity is creating conditions for novel or newness, things that are novel and new, help us to bring our skills to challenge us to create a unique scenario and we have to adapt our neurons are firing often at the network and then go hang on, how do we deal with this, it might take you a little bit longer, it might take you a little bit more in mind, increase that level of challenge for you.

David 42:25

But that newness and novelty are important. And you might repeat and repeat and repeat that until it doesn't feel new or novel anymore. That's why I say with Dr. Mike's work and his platform with brain HQ, we tend to get a saturation effect after a very in three to four months. When people have fired and use those cannons. That's when they need to have a stop because why have the novelties worn off?

David 42:52

Things like repetition and effort are here. But the novelty has worn off. That's when we need to think about making sure that things are connected to real-world experiences. So we can practice reaching and grasping the cones and picking up the various objects and repeat, repeat, and create something new by adding a different shape in there.

David 43:14

But for that gentleman that we spoke about right at the beginning of this conversation, and his return to being able to drink a Corona, we need to create a real-world situation. And we can practice those things of the arm and a movement, etc. But things need to be linked to the real world. You need to deal with the dynamic things that happen in day-to-day life.

David 43:36

And so we tried to engineer more of that into as well. Ultimately, we want to cement things around neuroplasticity it needs to be rewarding. And so when we're talking about what's the most important thing, goals, nailing, getting clear on our goals. They help add that secret sauce of I'm getting there I'm doing this is rewarding, I'm moving forward.

Bill 44:09

So it's about having a goal or several goals and achieving them or working towards achieving them. And then looking back on where you started reflecting on how I wasn't able to do X, and how far I've come in being able to do that now so that you can feel good about that you're making progress. And then you are motivated to continue to put in the effort and the doing, of neuroplasticity.

Bill 44:40

And then as a result of that as you continue to be able to for me, for example, walk across the road, when when it's safe, then speed up a little bit and run across the road when I need to get off the road quicker, and then potentially find another place where I could do something like that was part of something that I enjoy to do, for example, sport where I might not play a full 50-minute game or an hour game.

Bill 45:09

But I might be able to run for a small amount of time and kick a ball or do

something that I also previously enjoyed doing. So I've taken a task that was about making me safe across the road. Now I've turned it into a task that I can apply in another area, which is sports. So if I went to the sporting ground with my friends, I could still kick the ball even though I wasn't fully participating in a full-on game of soccer or football.

David 45:37

Exactly so you've seen the evolution of your goal, your first marker in that journey was I just want to walk. The second step in that journey was I'd like to walk better. And that walking better might be for me to get up and down from my bed at nighttime and get to the bathroom. That's me doing with confidence. I want to be able to do that. Indeed, journey said now I'm returning to work and I want to be able to move quickly about my work site or get out of the way of some incoming traffic because I do have to cross the road that I need to hop to it.

David 46:09

And I love running, I really wouldn't mind getting back to running. And for me, running might be, you know, just in the backyard with the kids or grandkids. And then from there went, I can do this. I wonder if I could get back to the gym down the road and do a little bit more vigorous stuff and get into that world. And if I could do that, what would be my next step?

## **The seven factors of neuroplasticity**



David 46:30

Now, you've seen the evolution of your goals. Seven factors are part of the

neuroplasticity ingredients list. So if you're the engineer of your recovery at home and you're listening to this, these seven things that I think are important for creating the conditions of neuroplasticity. You've got a goal in mind, Well, okay, what are the things that need to be present in the tasks to achieve them? We've already spoken about **repetition**, to repeat it, and you know, it might be an element of the activity.

David 47:07

Might be a sub-component of the overall task, when you run what will you describe, I need to walk a straight line first, you need to be able to do that and repeat, repeat, repeat, I need to have a **level of effort** number two level of effort needs to be there, that if it is something around the six to eight out of 10 levels of effort, that scale is going to change and it's your level of effort. It's not your therapist, it's not your loved one it's your level of perceived effort.

David 47:40

**It needs to be novel.** There needs to be some newness in this because if you repeat, repeat, repeat, that level of effort is going to change and you need to increase some novelty and newness with it. So it's **evolving** is perhaps the fourth point in all it's evolving. So what was the six, eight to eight out of 10 yesterday, weeks, likely, activity will not be six to eight out of 10. anymore, it's probably going to be a four.

David 48:10

We know that if we want those neurons to do their pruning, to do the growing. To do that strengthening work that we want, we need to make sure that it's always in that secret zone around that secret sauce zone forensics, eight and 10. So it needs to evolve. We need to be doing this for some time. So **duration** is important.

David 48:34

We need to be going after this and exposing ourselves to this exercise these steps these tasks, not only repetitively, but we need it in a good chunk of time we need to put in the reps and we need to do it over a block of time. things need to have a connection with the real world. If you're going to play football and a Professional League. And all you did was do gym workouts, do you think you're going to cut it on the field?

David 49:08

It's unlikely you will, you probably won't. So things need to have **real-world connections**. So you can do all your exercises in isolation, but they need to have an element of real-world practical application. So Bill for taking your running analogy maybe and that was the goal. Well, it's great to be able to do something on the physiotherapist's floor in the gym.

David 49:31

It's one thing to be able to walk across the flat surfaces of your home. It's another entirely to walk barefoot across the grass in the backyard with the grandkids or kids. We need to have real-world applications, we need that novelty there. And lastly, **things need to be rewarding**. Things need to have that element of success.

David 49:56

And having goals lined up and our sub-goals and those key steps are going to help us get on that pathway to success. And you know, all these activity elements are how we engineer that wonderful process in your brain that is available to you and me, and any stroke survivor out there, which is neuroplasticity. You put these ingredients in any task that you're doing with a goal in mind. You're going to put yourself in a better position for things to adapt, change, reorganize, and grow.

Bill 50:39

That's it. And what if you do put yourself and I know that that's how you go about supporting your clients? What if you do put yourself in that situation where things can adapt and grow, then what can people expect later in their lives? Like, what does that lead to? What comes from that?

David 50:58

Well, I think time is just one of those things that you wish you could collapse and step through a door. And it goes from one point to the next very quickly. And the thing, this is a hard journey Bill. You know, I don't want to sugarcoat this in any way at all to say that this is an easy journey. You've been dealt a hand of cards, and life has changed dramatically from what you did before the stroke to after the stroke.

David 51:23

And now you're in a position to make some choices in your life, that just require

daily effort and commitment. But in taking away from what others experience up for the show that you've put here, Bill to hear what others are experiencing and what professionals and I feel the demonstrating, we can see change over time.

David 51:44

Now for that gentleman who did not have any movement in his arm. When I say Did not he had more spasticity, and he had flickers of movement in his fingers. He had some wrist movement. He had some shoulder movement, but it wasn't pulled together functionally. From that, over time, on that basis, he was able to improve to achieve his goal. Grab a Corona and have a drink during a football game.

David 52:18

I've got colleagues who are using tools with robots, robotic-assisted upper limb recovery, where they are using the minutest level and flicker of movement as a basis to work from. We've got evidence coming out around the use of Transcranial direct stimulation and magnetic stimulation as having a top-down effect where we're having increasing excitation of neurons to allow them to adapt and change. There's not a lot of evidence to give us good confidence in what those treatment doses look like. But that's where we're heading.

Bill 53:06

But there is a lot of evidence about what we can do to support neuroplasticity, and how we can help people feel better about themselves, achieve things, and get back to experiencing a lifestyle that they prefer to experience one that makes them an active member of the community, of their family. And as a result of those seven things, repetition, efforts, the novelty or the newness, evolving, that thing that you're learning when it becomes easier involving it and making it a little bit difficult, more difficult to achieve,

Bill 53:47

And then the duration of that and putting in a lot of time and effort into that. And giving it a real-world application, which I think is important, and making it rewarding for me. All those things are things that I experienced didn't realize I was experienced we can do that. And definitely, people are going to notice some form of difference between where they were when they started and where they are sometimes down the track.

David 54:20



Exactly Bill. These are the ingredients that we can control the leavers, we can pull on in designing tasks around us which will create the conditions for neuroplasticity, or brain change.

Bill 54:40

Beautiful. Sounds like a perfect time to wrap up this podcast before we go. Where can people find out a little bit more about you?

David 54:53

Thanks, Bill. Yes, [occupationaltherapybrisbane.com.au](http://occupationaltherapybrisbane.com.au) is my practice's website, you can look at several resources that I've got there. I talk about stroke quite a lot on my website. I'm a few blog articles, that might be of interest to people as well.

Bill 55:10

And we'll put those links to any of those blog articles or anything that's related to stroke that you'd like to share on the show notes. David, thanks so much for the opportunity to have a chat with you. I appreciate it.

David 55:23

Thanks, Bill.

Intro 55:27

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