

*Increases in our understanding of brain development and plasticity provide new insights into how trauma affects the way the brain functions and the lives of people who are traumatised. This knowledge is opening the way to important advances in trauma treatment such as Neurofeedback, in which technology provides the means to assess brain function and to treat the damage caused by trauma effectively, Lynne Malcolm writes.*

# *The treatment of trauma and the power of Neurofeedback*

## **What effect does trauma have on us?**

The whole brain is affected by trauma, but particularly the amygdala, which controls emotions and instincts; the hippocampus, which is the memory centre; and the pre-frontal cortex, the area responsible for regulating impulses and emotions.

When a person is affected by traumatic events their brain changes and they can become over-reactive, hypervigilant and extremely sensitive to their surroundings, enabling past events to feel like they are happening in the present.

People impacted by trauma may experience a wide range of mental health conditions. Symptoms can include those related to diagnoses such as post-traumatic stress disorder (PTSD), attention deficit hyperactive disorder

(ADHD), oppositional defiant disorder, anxiety, autism, depression, obsessive compulsive disorder (OCD) – as well as chronic pain and other physical illnesses.

Psychiatrist Roger Gurr has worked tirelessly for human rights and mental health for 40 years. He set up the Australia's first community-based integrated mental health service and is conjoint associate professor of Psychiatry at the University of Western Sydney. Driven by his own personal experience of trauma earlier in his life – growing up gay in a hostile environment – he's committed to improving the treatment of trauma and related mental health conditions, which he says has been under-investigated and researched.

In his role as clinical director at Headspace Youth Early Psychosis Program for the past six years, Dr Gurr



Photo courtesy of STARTTS

has been shocked at the severity of developmental trauma seen in many of its clients. Despite the best efforts of staff, he says, there are insufficient means to care for them effectively and few services able and willing to take them on.

The Headspace Early Psychosis Program uses a world best-practice model of mental health care so he sees an opportunity to investigate Neurofeedback as an add-on approach to treat developmental trauma in these young people effectively. The Developmental Trauma, Mental and Physical Disorders and Neurofeedback research project was introduced in December 2020, supported by Parramatta Mission and the Uniting Church.

Dr Gurr's interest in Neurofeedback as a trauma treatment stems from his involvement with STARTTS. He was involved in initiating this organisation in 1988, having seen a need for a local refugee trauma treatment service. STARTTS for more than 30 years has been helping

people and communities heal the scars of torture and refugee trauma and rebuild their lives in Australia.

STARTTS works with clients who often have chronic and complex presentations. Most of the refugees coming to Australia have been exposed to multiple traumatic events, including war and violence, deprivation and the loss of loved ones. Many have been subjected to torture or severe human rights violations.

STARTTS annually treats about 7500 refugees of all ages and with every type of trauma. Staff members use a range of psychotherapeutic approaches, tailored to clients' needs. They are now using Neurofeedback as a part of their biological, psychological and social approach to the treatment of their clients.

Mirjana Askovic is a senior psychologist and Neurofeedback practitioner at STARTTS. She was first employed at STARTTS in 2001 as a general counsellor, and many of her clients then had recently arrived from

*Multiple studies have shown that up to two-thirds of young people have been exposed to at least one traumatic event by the time they reach the age of 16. Those from refugee backgrounds or Torres Strait Islanders are likely to have experienced much higher levels of trauma.*

former Yugoslavia, as she had. She began to notice that there were limitations, especially in treating children, and Cognitive Behavioural Therapy (CBT) wasn't effective. Many of her clients were so highly strung and so reactive that any mention of traumatic events could lead to dissociation and retraumatisation. Mirjana had heard about Neurofeedback which is based on the concept that the brain is plastic – in the sense of being able to change – and that it can be trained to better manage stress associated with trauma.

She then became a champion for this technique and is now the Neurofeedback Program Coordinator at STARTTS and Director for the Australian Neurofeedback Institute (ANFI), which is a centre of excellence for trauma treatment.

Mirjana cites an anonymous case study of a man in his 50s who came to see her at STARTTS after not responding to different types of treatment by psychologists

and psychiatrists, including counselling, CBT and medication. He was also self-medicating via drug and alcohol abuse to cope with his symptoms.

When Mirjana first saw him he had severe nightmares, only ever slept a couple of hours at night and was having frequent flashbacks of trauma, some of which started early in life. He'd been sexually abused as a young child and bullied and beaten at school and on the street. He'd had time in prison because of his minority, religious and ethnic background and was tortured there. His journey to Australia was extended and traumatic and, just as he began to relax and feel safe in the couple of years after he arrived in Australia, he was attacked in the street and his jaw was broken.

Such horrific life experiences, Mirjana Askovic says, means people's nervous systems become so dysregulated that it's hard for them to speak about it or to benefit from different types of psychotherapeutic interventions to help them process trauma and learn to regulate their body and their nervous system.

The client told Mirjana that he would agree to try Neurofeedback for two sessions a week, as long as he wasn't asked to talk about his traumatic experiences.

After the first few sessions, which focus on trying to re-regulate the nervous system, he started to feel calmer and sleep better, and his craving for alcohol and drugs was reduced. Then he spontaneously started to talk about his traumatic events, once he felt stronger and more in control. Gradually Mirjana was able to introduce talking therapy alongside Neurofeedback training.

### **What is Neurofeedback and how does it work?**

There is a growing body of evidence of a direct link between trauma and changes in our brain wave activity. Mirjana describes Neurofeedback as a type of training for the brain. It can also be likened to physiotherapy, but for the brain and the nervous system. It uses technology to improve the brain's ability to self-regulate, then become more resilient.

What prompted STARTTS to use Neurofeedback is that they saw in clients who are traumatised that the brain works in a type of reverse pattern. At times when they should be awake and alert to deal with everyday life, the brain is easily triggered into a state of tiredness, of feeling disconnected or dissociated. Alternatively, they go into overdrive, often becoming extremely agitated, anxious or angry.

In either state they can't function properly. Both states, shown in electroencephalograms (EEGs) of brain wave patterns, are different from what you would expect in



people who are fully focused and functioning well. To help clients reverse these patterns, Neurofeedback – one of the modalities of Biofeedback – is used.

Biofeedback uses simple computer software with sensors connected to the body to measure blood pressure, brain waves and body temperature, and that information is immediately fed back to the client. It provides them with immediate physical information about what's going on in their bodies and their brains, which they can use to change the way they are thinking and feeling.

During a Neurofeedback session the client sits comfortably in a recliner in front of a computer screen and has sensors attached to their skull, while the monitor displays their brain wave activity from moment to moment. If the client comes into the room in a state of agitation, they can see the brain wave activity associated with that state. The practitioner can then help them calm down through deep breathing and mindfulness techniques, and they will see the change in their brain waves.

The technique can also be used with children and adults with intellectual disabilities by asking them to play computer games. For example, they may need to make a rocket fly in a game with good brain waves, or stop other rockets flying with bad brain waves. They will see on the screen how the brain wave activity changes according to the wins or rewards they receive when playing the game. They can link what they see on the screen with what they experience emotionally. The more they understand this relationship, the more motivated they are to use Neurofeedback and the more empowered they feel.

Mirjana says that after about 20 sessions the client can start to experience improvement, often feeling a reduction in anxiety and tension. It's enough to record change – but probably not enough to get permanent change. Neurofeedback is a learning technique that takes time and practice. In the same way that you need to go to the gym regularly to build fitness, you also need to have regular Neurofeedback sessions. It varies from person to person, but she says that after about 40 sessions many of her clients see significant change.

There are no side effects and once the brain has made the changes, they appear to be permanent.

### **What is the scientific evidence for the use of Neurofeedback in the treatment of trauma?**

In evaluating the efficacy of Neurofeedback for PTSD, Mirjana explains that they initially reviewed four randomised control studies that were designed to up-regulate the alpha brain wave rhythm generally associated with a calm, relaxed state. All studies showed

significant reduction in PTSD symptoms following Neurofeedback training.

For example, a study by Bessel van der Kolk et al., 2016, was done in the randomised, waitlist-controlled manner. Clients with chronic PTSD in the Neurofeedback group, compared with the control group that received treatment as usual, showed significant PTSD symptom improvement, as well as improvement in emotional regulation, one of the most troubling symptoms related to chronic PTSD.

The best designed study just recently published by Nicholson et al., 2020, shows evidence for therapeutic changes following Neurofeedback in the functioning of two major brain networks, the Default Mode Network and the Salience Network, that are known to be associated with PTSD psychopathology.

While awaiting further replication of these findings in a controlled study, Neurofeedback for PTSD is rated as “probably efficacious” (level 3 of 5 levels of efficacy).

Mirjana and the STARTTS team are currently conducting a Systematic Review and Meta-Analysis of Clinical and Neuropsychological Outcomes from Neurofeedback Clinical Trials for PTSD, looking at the effects of Neurofeedback on chronic PTSD symptoms, and neuropsychological and cognitive deficits related to PTSD in traumatised adults.

### **The potential of using Neurofeedback in the treatment of trauma in youth.**

As Clinical Director of the Headspace Youth Early Psychosis Program, Dr Gurr is determined to investigate how Neurofeedback could be added to the treatment regimen of the young. He says that STARTTS is probably the biggest, most effective and sophisticated trauma treatment service in the world, so he's drawing on its expertise.

He has invited Mirjana to join his team on the “Developmental Trauma, Mental and Physical Disorders and Neurofeedback” research project. The potential of Neurofeedback to re-regulate a traumatised brain could be particularly powerful in treating young people. Multiple studies have shown that up to two-thirds of young people have been exposed to at least one traumatic event by the time they reach the age of 16. Those from refugee backgrounds or Torres Strait Islanders are likely to have experienced much higher levels of trauma. Developmental trauma is a term used for repeated and extended periods of trauma, which is often a result of emotional, physical and/or sexual abuse. Its effects can be passed on through subsequent generations via parental behaviour and



Photo courtesy of STARTTS

epigenetic memories. The epigenetic process means that trauma can be inherited.

The way a person responds to trauma is determined by evolutionary protective mechanisms, their genetic influences and their stage of life. The period between the ages of 12 and 25 is a very important time for brain development. At puberty the brain stops growing and prunes or removes, for efficiency, connections that are no longer needed. This is when peer interaction and the drive to attract the best mate becomes really important for young people, so trauma at this time is particularly damaging. Because developmental trauma interacts with individual genetic factors and causes the brain to dysregulate, it has a major role in psychosis, some anxiety and mood disorders, personality disorders, eating disorders and alcohol and other substance abuse. Also, whichever disorder is diagnosed, the more severe the

trauma experienced, the more severe the symptoms will be.

Dr Gurr says that during this stage of life, the brain is also highly plastic or changeable – so treatments which use operant conditioning or learning, such as Neurofeedback, have an excellent chance to produce faster functional improvement.

While other social and psychotherapy treatments are still important in conjunction with treatments such as Neurofeedback, Dr Gurr says that trauma-sensitive care is not enough. We need to actually re-regulate the brain. It appears that once the brain is effectively trained using Neurofeedback, the benefits can be permanent.

The research project run by Dr Gurr at Penrith Headspace is offering supplementary treatment to 30 young people with high risk or first episode psychosis and developmental trauma. They undergo EEG analysis and EEG-guided

*Mirjana had heard about Neurofeedback which is based on the concept that the brain is plastic – in the sense of being able to change – and that it can be trained to better manage stress associated with trauma.*

Neurofeedback, receiving two sessions per week over 10 weeks unless a more individualised approach is needed. Dr Gurr says that the case series study is going very well and more than meeting their expectations.

**Now is the time to break the cycle of developmental trauma.**

According to Dr Gurr, developmental trauma is probably the most unified cause of many severe mental health disorders, but is the one given the least specific treatment.

He describes the economic impact of not treating trauma effectively as “dismal” because it can have devastating consequences on people’s mental and physical health throughout their lives, adding that if we can learn to effectively treat developmental trauma it would be the greatest public health achievement possible.

There have been many Australian and international

studies analysing the costs of developmental trauma. For example, in the US the Adverse Childhood Experiences (ACE) studies, under the Centres for Disease Control and Prevention, found that the trauma caused by child maltreatment was the nation’s mostly costly public health issue.

The evidence in Australia shows that increased spending on suicide prevention, for example, has not reduced suicide rates in young people, and that about three-quarters of those who achieve suicide have some developmental trauma – so suicide prevention must include treating the trauma.

**The contribution by STARTTS and the Australian Neurofeedback Institute.**

STARTTS is leading the way in the field of Neurofeedback treatment for trauma. In 2019 it established the Australian Neurofeedback Institute. It’s a social enterprise to raise revenue to provide Neurofeedback as a therapy to refugees unable to afford the treatment. It integrates the latest neuroscientific research, neuromodulation technologies and psychological interventions. It also provides certified training and mentorship for Neurofeedback practitioners as part of a commitment to provide the highest quality of care to its clients, and members of the wider community affected by trauma. “This is our way of giving back” says Mirjana.

She describes a case she worked on that inspires her to continue to work with Neurofeedback. A five-year-old child was referred to STARTTS by his school, which was really concerned that he might have an intellectual disability. He came to Australia from Iraq with his mother when he was two years old. They’d been separated from his father, so his mother was also grieving and traumatised.

The boy was not really verbal, and was very anxious and frightened. Mirjana recalls that after 35 sessions of Neurofeedback he’d become more engaged with his schoolwork and family. When he finished treatment the teachers were happy with his progress, he was learning well, he was sleeping better at night and was less anxious. His relationships with his family and friends improved too.

Then, to Mirjana’s delight, 15 years later, the boy got in touch with her to tell her that he’d finished his Higher School Certificate and had enrolled in architecture at university, Mirjana says.

“In all my career I never felt so privileged and so happy that he had Neurofeedback,” she says. “For someone who so early in life was at a disadvantage, who might have been diagnosed with a mild intellectual disability, actually he’s brilliant now, he’s thriving. It shows how much can be done to make change, especially for children and young people who have their whole life ahead of them.”<sup>R</sup>