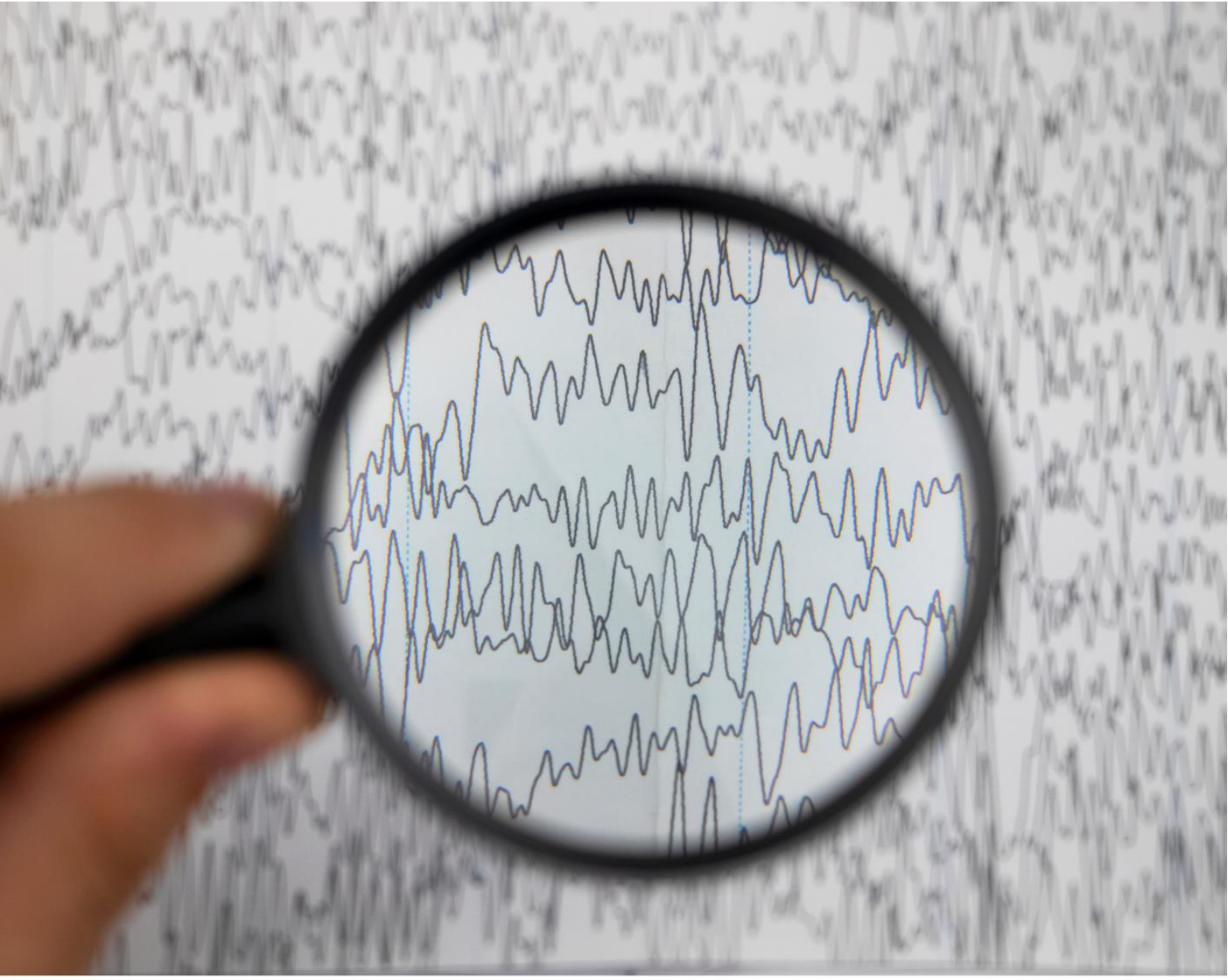

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Alpha Neurofeedback: Reaching a New Steady State After Trauma

Ruth Lanius[a*]

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Abstract

Electroencephalogram (EEG) neurofeedback, aimed at reducing the amplitude of the alpha- rhythms in the brain, has been shown to alter critical brain networks associated with post-traumatic stress disorder (PTSD), resulting in symptom alleviation among individuals with PTSD. A recent RCT has shown that alpha neurofeedback can lead to clinically meaningful reductions in PTSD symptoms. The mechanism underlying these neuroplastic changes of alpha neurofeedback are beginning to be revealed and will be discussed during this keynote. Moreover, the application of this type of neurofeedback in patients with complex trauma and dissociative symptomatology will be illustrated through case examples. Finally, combining alpha neurofeedback with traditional Indigenous practices will be described as a means of addressing the intergenerational transmission of trauma in this population.

Presented on: October 15, 2022

Presented at: 16th ANSA Annual Conference "Neuromodulation for Optimal Performance in Times of Stress and Trauma"

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Biography of the Author

Ruth A. Lanius, M.D., Ph.D. is a Psychiatry Professor and Harris-Woodman Chair at Western University of Canada, where she is the director of the Clinical Research Program for PTSD. Ruth has over 25 years of clinical and research experience with trauma-related disorders. She established the Traumatic Stress Service at London Health Sciences Centre, a program that specialises in the treatment of psychological trauma. Ruth has received numerous research and teaching awards, including the Banting Award for Military Health Research. She has published over 150 research articles and book chapters focusing on brain adaptations to psychological trauma and novel adjunct treatments for PTSD. Ruth regularly lectures on the topic of psychological trauma both nationally and internationally. Ruth has co-authored two books: The Effects of Early Life Trauma on Health and Disease: The Hidden Epidemic and Healing the Traumatized Self: Consciousness, Neuroscience, and Treatment. Ruth is a passionate clinician scientist who endeavours to understand the first-person experience of traumatized individuals throughout treatment and how it relates to brain functioning.

Walking the Tiger Trauma and Letting it Sleep: The implications of recent neuroscience findings for neurofeedback in the treatment of developmental.

Sebern F. Fisher[a*]

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Abstract

When a friend handed me a copy of Peter Levine's book on trauma, I misread the title and I imagined this beautiful wild creature walking quietly in front of me on a leash. Misread or not, this has become my focus with neurofeedback over my last twenty-five years. I have wanted to, at the very least, domesticate the savage terror that is developmental trauma, to quiet it, to let it sleep. In this talk I'll share three findings from the Lanius lab that I think demonstrate the core damage done by neglect and abuse in early childhood and provide an overview of the protocols and therapy I use to address this all too common catastrophe.

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Biography of the Author

Sebern F. Fisher, MA, is a psychotherapist and neurofeedback practitioner in private practice who specializes in attachment issues. She trains professionals nationally and internationally on neurofeedback, neurofeedback and attachment disorder, and the integration of neurofeedback with psychotherapy. From 1980 to 1997, Sebern was the clinical director of a residential treatment program for severely disturbed adolescents in western Massachusetts. At that time, it was considered to be one of the best such programs in the state and, by in large, the treatment outcomes were abysmal. In efforts to better understand these kids and to enhance treatment outcomes, she introduced attachment theory in the mid-eighties and in 1991, Dialectical Behavior Therapy. Her center became the first in the nation to adopt and implement DBT in a residential milieu. Sebern discovered neurofeedback for her own brain in the spring of 1996. She went into full time private practice in 1997 and began to integrate neurofeedback with psychodynamic psychotherapy. Her book, Neurofeedback in the Treatment of Developmental Trauma: Calming the fear-driven Brain is a direct result of this work.

The Impact of Neurofeedback on Children and Adults with Developmental Trauma: Two Random-Control Studies

Ainat Rogel[a*]

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Abstract

Developmental trauma (DT) is arguably one of the costliest public health challenge in the USA. DT is a chronic early childhood exposure to neglect and abuse by their caregiver. It has been shown to have a long-lasting pervasive impact on mental, physical and neural development, including problems with executive functioning, attention, impulse control, self-regulation. These deficits not only interfere with adequate daily functioning and a shorter lifespan, but might also compromise the ability to benefit from other treatments. We describe our results of two randomized control studies with participants who had experienced DT. The first study is with adults and the second study is with children ages 6-13. The results, for both the adults and the children, show that 24 sessions of Neurofeedback Training (NFT) significantly reduced the symptoms of Post-Traumatic Stress Disorder (PTSD) and improved executive functioning. In addition, for the children, NFT significantly reduced externalizing and internalizing behavioral problems. The presentation argues for the need of additional studies with a larger sample size, longer course of NFT, and different protocols as well as an analysis of differential impact of type, length and age of onset of the trauma(s). A longer course of NFT (e.g. more sessions) and follow-up assessments covering a longer time period are both necessary to determine whether NFT gains can be maintained over time, and whether booster sessions will be beneficial.

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Biography of the Author

Ainat is the founder and director of Boston Neurodynamics. She conducts neurofeedback (NFB), biofeedback (BFB), performs and analyzes brain mapping (qEEG), supervises NFB practitioners. She teaches NFB related courses, gives international presentations, and conducts evidence-based research. Ainat serves in various roles on the ISNR Board of Directors including as President.

In her practice, Ainat focuses on developmental trauma, dissociation and PTSD. Her unique holistic approach incorporates NFB and BFB with talking and body therapy.

Ainat has a PhD in Computer Science and Neurobiology, and a master in Social Work. She is a licensed Independent Clinical Social Worker, and a BCIA certified NFB provider and supervisor. She was a scientist in brain research at various institutions including Massachusetts Institute of Technology, the Martinos Center for Biomedical Imaging at MGH-Harvard, Hebrew, University and Ben Gurion university. She worked as a NFB researcher and clinician at the Trauma Center at JRI.

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Trauma, neuro-inflammation and psychedelic neuromodulation: the path forward

Dirk De Ridder[a*]

[a]*Dunedin School of Medicine, University of Otago; Manipal University, India; University of Bonn, Germany.*

Abstract

Trauma can cause both physical and psychological damage, followed by repair via inflammatory responses. In a normal setting acute inflammation induces healing, both physically and psychologically. Depending on genetic, epigenetic and microbiome factors this inflammatory process can become chronic, resulting in only partial healing with persistence of trauma associated symptoms. This chronic inflammation will alter the activity but especially connectivity within and between the three canonical cognitive networks in the brain. The triple network becomes dysfunctional, generating cognitive and autonomic symptoms and the emotional network becomes engaged at a resting state level, generating emotional problems.

Treatments exist, consisting of psychotherapy, EMDR and medication, yet sometimes these provide insufficient benefit. Non-invasive neuromodulation is a novel treatment approach that can target the triple network and has anti-inflammatory effects. Extending trauma treatment with psychedelics to disrupt pathological connectivity within and between the brain networks, and subsequently rebuilding the networks with neuromodulation such as transcranial magnetic stimulation and transcranial electrical stimulation may be the path forward.

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Biography of the Author

Dirk De Ridder, MD, PhD, is professor of Neurosurgery at the Dunedin School of Medicine, University of Otago in New Zealand and runs a private clinic in Belgium. He is also associated with Manipal University in India, and teaches at the University of Bonn in Germany.

His research is based on 2 pillars: 1. Network science, in which any symptom is the emergent property of a changed network, and 2. the Bayesian brain concept, i.e. considering the brain as a predictive machine that updates its predictions by active exploration of the environment through the senses, as a way to reduce the inherent uncertainty in a changing environment. Phantom percepts are seen as a maladaptive network phenomenon due to deficient updating resultant from sensory deafferentation. Trauma and PTSD can be approached from a Bayesian perspective.

His main research interest is the understanding and treatment of phantom perceptions (tinnitus, pain), especially by use of functional imaging navigated non-invasive (TMS, tDCS, tACS, tRNS, LORETA neurofeedback) and invasive (implants) neuromodulation techniques.

The approach to unravel phantom percepts is by developing an understanding of commonalities in different diseases such as in thalamocortical dysrhythmias (pain, tinnitus, Parkinson disease, depression, slow wave epilepsy) and reward deficiency syndromes (addiction, OCD, Personality disorders, …). This has led to novel treatment approaches for neurological and psychiatric disorders.

He has developed "burst" and "noise" stimulation as novel stimulation designs for implants, and is currently working on multifocal or network stimulation, as well as reconditioning stimulation. Burst stimulation is commercialized by Abbott as BurstDR = Burst D(e)R(idder) stimulation.

Recently he has embarked in collaboration with the Departments of information Sciences and Computer Science at the University of Otago on artificial intelligence approaches for large scale pattern recognition of EEG brain signatures for pain, tinnitus and obesity.

He has written 40 book chapters and more than 300 pubmed listed journal articles. More than 170 articles relate to network approaches for brain disorders. This has resulted in a Google Scholar H-index of 74, with more than 20,000 citations and an i10 index of 249.

Brain mechanisms underlying the impact of refugee trauma and stressors

Belinda Lidell[a*], Pritha Das[b], Gin S. Malhi[c], Kim L. Felmingham[d], Tim Outhred[e], Jessica Cheung[f], Miriam Den[g], Angela Nickerson[h], Mirjana Askovic[i], Jorge Aroche[j], Mariano Coello[k], Richard A. Bryant[l]

[a]*School of Psychology, University of NSW ; Deputy Director of the Refugee Trauma and Recovery Program.*

Abstract

Refugees face significant difficulties, including being exposed to conflict, human rights violations, persecution and ongoing uncertainty and stress in the post-displacement environment. These factors contribute to elevated risk for psychological disorders in refugee populations, including PTSD. While there are good neural models of PTSD generally, it is likely these models do not fully account for the context of forced displacement trauma and stress. It is therefore critical that specialised research be conducted to understand the brain mechanisms disrupted by refugee trauma and stressors. In her talk, Belinda will share key findings from a large neuroimaging research project conducted with refugees and asylum seekers living in Sydney Australia. Over the course of 3 years, over 120 refugees participated in a series of functional magnetic resonance imaging (fMRI) studies. First, she will present a study that demonstrates the specific effects of torture trauma exposure on intrinsic functional brain network connectivity. Second, she will share a study that shows that cumulative trauma exposure and post-migration stress have specific effects on the neural substrates of fear processing in refugees. Next, she will focus on two studies that examine the neural impact of specific post-migration stressors. In the third study, she will show that refugee visa insecurity disrupts default mode network functional connectivity. Finally, in the fourth study, she will demonstrate that separation from family affects attachment system buffering of emotion regulation brain activity in refugees. Collectively, these studies provide evidence of the detrimental and long-term impact of refugee trauma and stress on the brain, and have implications for informing new strategies to support refugees in their trauma recovery and resettlement.

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Biography of the Author

Dr. Belinda Liddell is a Senior Research Fellow in the School of Psychology at UNSW Sydney and the Deputy Director of the Refugee Trauma and Recovery Program. For the last 9 years, she has been conducting research that draws upon a neuroscience and psychological science framework to understand the biological, social and cultural mechanisms underlying the impact of refugee trauma and stress. She has published over 75 studies and her work is funded by the Australian Research Council and NHMRC. Belinda works closely with leading humanitarian and refugee service organisations including STARTTS, Australian Red Cross, Settlement Services International and International Committee of the Red Cross, to ensure her research is relevant and has significance for practice and policy. Belinda holds a PhD in Cognitive Neuroscience from the University of Sydney and has previously worked in Cambodia and Timor-Leste. She is interested in science communication and was one of the ABC Top 5 Scientists in 2018.

Trauma-Focused Clinical Neurofeedback: A Case Report On Emotional-Based Customized Protocol for Anxiety and Focus Problems

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Abstract

A thirty-eight year old woman suffering from Ophidiophobia, and other anxiety symptoms sought help. There was evidence of some prior traumatic experiences underlying some of her symptoms. There was also evidence of some difficulties with executive functioning. These symptoms were impacting upon her work performance. She undertook twelve sessions of neurofeedback training, after which assessment pointed to significant improvement in symptomatology.

Prior to beginning neurotherapy, Miss E underwent three sessions of clinical hypnotherapy. The hypnotherapist concluded that these symptoms were related to problems linked to attachment issues in relation to Miss E's parents. Previous research has linked a person's attachment style to their brain wave activity (Ma et al., 2017).

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1. Background

Miss E is thirty-eight years of age. She has received a high school education and currently works as a business assistant to her husband, helping with book keeping and accounting. She is also responsible for all housework, shopping and food preparations at home. She lives with her husband and two children.

Miss E described herself as a perfectionist. She has significant issues with respect to insomnia. She indicated difficulties with attention, memory and comprehension. She also indicated that she is easily startled by such things as somebody opening a door or walking near her. She also described long-term ophidiophobia (fear of snakes) from a young age. She traces this fear back to an incident early in her life when her younger brother frightened her with a toy snake. She indicated that all these symptoms are having a serious impact on her daily life.

1.1. QEEG brain mapping

Quantitative electroencephalography (QEEG) involves the application of EEG data to numerical modeling, primarily power spectral analyses, to obtain quantitative metrics relevant to behavioural-cognitive functions of the brain (Sandro, 2020). Past researchers have found that QEEG has high reliability and validity (Thatcher, 2010). According to Napflin and others, the QEEG has high reliability with a test re-test reliability >0.9 (Napflin et al, 2008).

1.2. Clinical neurofeedback

Neurofeedback has been found to help people to reduce symptoms relating to anxiety, depression, post-traumatic stress disorder and chronic insomnia (Walker, 2011). Neurofeedback has also been found to help people with stress management and to reach peak performance in their life (Gray, 2017).

Neurofeedback has been shown to positively affect sleep. Most clients can train their brain to enhance sleep and this transition can be remarkably rapid for clients who have tried many other treatments and suffered sleep difficulties for years (Mey, 2020). Neurofeedback has alsobeen found to significantly reduce symptoms of PTSD (Gapen et al., 2016; Rogel et al., 2020). Neurofeedback intervention is also effective for anxiety reduction (Cho et al., 2018; Menaella et al., 2017). It was also found that Symptoms of anxiety significantly decrease with decreases in the amplitude of Hi-Beta brain wave activity after undertaking neurofeedback (Wang et al., 2019).

1.3. Frequency training neurofeedback

Frequency training in neurofeedback is referring to the regulating of particular bandwith brainwaves to improve the psychological concerns of the individuals (Linden, 2014). For example, in dealing with anxiety, the down-regulating of Hi-Beta waves would be implemented. When conducting the session, operant conditioning model brain stimulation techniques will utalize a computer interface to provide real-time brainwave activity information to assist in modulation and improve functioning (Campos da Paz et al., 2018). Training is usually conducted weekly for an average of 20 weeks. Some people need fewer sessions, while some people require more (Kubik, et al., 2016).

2. Assessment

Miss E undertook an assessment of brain function using quantitative electroencephalogram (QEEG). The assessment pointed to increased levels of arousal in both left and right temporal lobes. The assessment pointed to excess amplitude in the high beta frequencies relative to the database (23-38 hertz). It is hypothesised that this excess fast wave activity is related to Miss E's anxiety symptoms.

The assessment also pointed to some excess slow wave activity (2-4 hertz) in left and right frontal sites relative to the database. It was hypothesised that this excess slowing was likely related to issues that Miss E had with respect to attention, planning and motivation as well as possible difficulties with emotional processing and visual working memory.

3. Intervention

Miss E participated in weekly neurofeedback sessions. This included SMR training at the site of her left temporal lobes (T3 site) and left parietal lobe (P3 site). The feedback which was included as part of this training utilised relaxation videos. The aim of this training protocol was to reduce symptoms with respect to ruminating thoughts and anxious feelings.

In the second part of the neurofeedback training, activity within the beta range was rewarded in the left frontal lobe (F7 site) and SMR training was undertaken in the right frontal lobe (F8 site). Movie clips were used as feedback. The aim of these sessions was to activate Miss E's frontal lobe in order to promote executive function and also affect regulation.

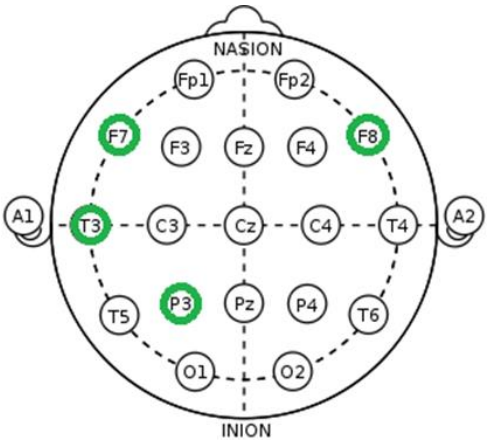

Fig.2 Targeted location of brain to be trained

During the SMR training at T3, we also focused on inhibiting Hi-Beta brainwave activity aiming to alleviate E's issues with anxiety, excessive worries, poor sleep quality and fast speech (Hammond, 2005). The other major purpose in reducing Hi-Beta brainwave amplitude at T3 site was to reduce her ophidiophobia symptoms which seriously affected her daily life. The SMR training protocol implemented at P3 aimed to help E to promote better cognitive processing and organizing capability in dealing with the crisis situations more effectively (Cappelletti et al., 2010). The third training protocol of rewarding Beta brainwave and inhibiting Delta, Theta and Alpha brainwaves concurrently at E's F7 site aimed to improve her attention span and motivation during work time (Bellomo et al., 2020). Finally, the SMR training protocol at E's right frontal lobe area (F8 site) was applied to enhance her emotional regulation. Training at F8 has also been found to improve attachment issue and judgemental skills (Marzbani et al., 2016). It was therefore hoped that E's problems with perfectionism might also be reduced.

4. Outcome of Intervention

After twelve sessions of neurofeedback, a post QEEG was undertaken. This found a significant reduction in the amplitude of beta waves in the temporal lobes. After the twelve sessions of training, it was also found that the amplitude of high beta activity at the T3 site had also reduced significantly.

The second protocol incorporated frontal training at F7 and F8. Miss E undertook training at F7 improving concentration and motivation. Training at the F8 site was hypothesised to help with emotional regulation as well as issues relating to low self-esteem and low self-confidence (Donaldson et al., 2018). Data gathered pointed to a significant downward trend in slow wave activity through the process of training.

Table 2. Outcome of intervention

Presenting issues	Outcome of intervention
Having trouble to fall asleep at night	Able to fall asleep easier at night
Rapid speech	Reduced speaking rate
Ophidiophobia: Frequently anxious about snakes	Reduced anxiety level and feeling calmer
Perfectionism	Improved in mental flexibility
Low attention level and motivation	Increased attention span and motivation

5. Follow Up & Discussion

Assessment undertaken through the course of treatment indicated that after six sessions of training, Miss E reported feeling more relaxed. She reported that she was not as easily startled in her day to day life. She was able to more calmly look at pictures of snakes or strip type objects which she had previously found upsetting. She also repeated that there was an improved quality of sleep. There was already a significant reduction in symptoms associated with anxiety, worry and tension.

Miss E also reported that she was performing tasks more efficiently at both at home and at work. She also reported feeling more accepting of herself and thus experienced less tendencies to perfectionism. She seemed less worried about how others might judge her. In general, she reported a significant improvement with respect to her quality of life as a result of reduction in her symptoms.

Assessment indicated that Miss E's level of anxiety continued to decrease through the course of training. A Generalized Anxiety Disorder Questionnaire (GAD-7) was used to track E's progress. Initially, her responses indicated anxiety symptoms that were "severe." By the 10th neurofeedback session symptoms as measured on this scale had reduced to a "mild anxiety level."

Feedback also pointed to improvements in her job performance with better ability to focus and greater attention span. She also reported improvements in her motivation and problem solving skills at work.

Miss E also reported that following her involvement in neurofeedback, difficulties that she had with respect to tinnitus also decreased. Presumably, training down excess fast wave activity in the temporal lobes may have significantly impacted upon Miss

E's tinnitus symptoms. This may present a useful protocol to use with people who suffer from tinnitus in the future (Ueyama et al., 2013)

6. Conclusion

This case study provides further support for the utilization of QEEG guided neurofeedback as part of an intervention to benefit those who experience symptoms which can be traced back to experiences of early trauma.

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