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KEYNOTE PRESENTATIONS

Homeostatic Normalization of Alpha Brain Rhythms Within the Default Mode Network and Reduced Symptoms in PTSD Following a Randomized Controlled Trial of EEG Neurofeedback

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Collective research has identified a key electroencephalogram (EEG) signature in patients with posttraumatic stress disorder (PTSD), consisting of abnormally reduced alpha (8–12 Hz) rhythms. We conducted a 20-session, double-blind, randomized controlled trial of alpha-desynchronizing neurofeedback in patients with PTSD over 20 weeks. Our objective was to provide mechanistic evidence underlying potential clinical improvements by examining changes in aberrant PTSD brain rhythms (namely, alpha oscillations) as a function of neurofeedback treatment. We randomly assigned participants with a primary diagnosis of PTSD (n = 38) to either an experimental group (n = 20) or sham-control group (n = 18). In line with our earlier studies, the experimental group received desynchronizing neurofeedback aimed at reducing alpha power (see Kluetsch et al., 2013). A multichannel EEG cap was used to record whole-scalp resting-state activity pre- and postneurofeedback treatment for both the experimental and sham-control PTSD groups. We firstly observed significantly reduced relative alpha source power at baseline in patients with PTSD as compared to an age and sex-matched group of neurotypical healthy controls (n = 32), primarily within regions of the anterior default mode network. Posttreatment, we found that only PTSD patients in the experimental NFB group demonstrated significant alpha resynchronization within areas that displayed abnormally low alpha power at baseline. In parallel, we observed significantly decreased PTSD severity scores in the experimental neurofeedback group only, when comparing baseline to posttreatment (Cohen's d = 0.77) and 3-month follow-up scores (Cohen's d = 0.75), with a remission rate of 60.0% at the 3-month follow-up. Overall, our results indicate that neurofeedback training has the capacity to rescue pathologically reduced alpha rhythmicity, a functional biomarker that has repeatedly been linked to symptoms of hyperarousal and cortical disinhibition in PTSD. This randomized controlled trial provides long-term evidence suggesting that the "alpha rebound effect" (i.e., homeostatic alpha resynchronization) occurs within key regions of the default mode network previously implicated in PTSD.

School Failure, Scientific Correlates (qEEG-HCF) New Contributions of Neurofeedback Treatment

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Nowadays, school failure is considered a public health problem with a prevalence of 60% of the world population. Economic, geopolitical, and psychological factors are among the most relevant causes. There are, however, neurobiological causes that are largely overlooked by primary care professionals, as well as unknown to many professionals in the academic field. This particularity leads to the fact that certain neurodevelopmental disorders present late and ineffective therapeutic actions. The scientific literature reports that the population with severe learning disorders show low levels of effectiveness in pharmacological treatments and long periods of time to compensate for the difficulties through specialized didactic programs. In the last decades, thanks to neuroimaging studies in people with learning disabilities, structural and functional abnormalities in brain connectivity have been evidenced, which certify the academic alterations to which between 5% to 15% of the child population is subjected (DSM-5-2014).

The scientific literature of the last decades shows benefits with neurofeedback (NFB) treatments in neurodevelopmental disorders, being conclusive in attention-deficit disorders in its different subtypes. However, in learning disorders, it begins to have more evidence in recent decades. There is evidence suggesting that NFB treatment allows the improvement of learning difficulties presented by this population; training the brain electrical activity, especially with the use of quantitative electroencephalogram (qEEG) studies, which allow personalized protocols.

This lecture will focus on the evidence of the last years in the treatments for NFB in the field of neurodevelopment (ADHD, autism spectrum disorders, specific language disorders, learning disorders, and others), with greater incidence in learning disorders. The presentation will be focused on the explanation of different clinical cases evaluated objectively in their superior cortical functions (FCS) through standardized techniques such as Wisconsin Card Sorting Test, Continuous Performance Test, Rey Complex figure Test, RAVLT, Trail Making Test, and others; as well as quantitative electroencephalograms (qEEG) pre–post NFB treatment.

Hang 'Em High: Neurotoxicology and qEEGs in Tort Evaluation

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There is no debate that the diagnosis of mental health disorders has dramatically risen over the past 100+ years. However, it is equally likely that this increase is not merely a result of analytical advances and changing lifestyle but also due to a rapidly increasing exposure to neurotoxic agents. At the same time those economically benefiting from the pervasive use of neurotoxins have sought to minimize this toxicity and create scientific debate about whether the pervasive effects are causative. This debate has often been designed to propagate a balancing test as to what constitutes responsible corporate conduct and who should bear the ultimate responsibility for the costs related to what may be described as abnormal brain function. If those disseminating the toxins are responsible for abnormal brain function as a result of their metallotoxins (most notably lead) and lipophilic toxins, etc., then how does the judicial system allow for recompense based upon that neurotoxicity? Can such necessary proof rely on neuropsychological tools, such as qEEGs?

The Good, the Bad, and the Ugly: Psychology and Human Rights

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Psychologists and psychology have played a pivotal role in the evaluation of human rights, both in relation to abuses and analysis and treatment for the ramifications of that abuse. This part of the talk will discuss three aspects of the intersection of human rights with psychology over the last 2 decades.

The first will be what I have termed "the ugly." Psychologists James Mitchell and Bruce Jessen employed the learning and research of the mental health profession to implement an interrogation regime which they described as "enhanced interrogation techniques" and others have described as torture. Should it have been justified? See the U.S. Supreme Court brief I wrote: https://www.supremecourt.gov/DocketPDF/20/20-827/188164/20210820153945725_20-827%20USA%20v%20Zubaydah%20Brief%20of%20Amici%20Curiae%20in%20Support%20of%20Respondents.pdf

The second is what I term "the bad." A purported psychological syndrome, known as "Excited Delirium," has pervaded law enforcement and been routinely diagnosed to justify an extraordinary use of great force on the basis that the condition could impart superhuman strength to individuals when undergoing arrest. While the psychological diagnosis remains in many police manuals, in the past few years it has been disowned as a diagnosis by almost every major medical diagnostic body.

And for "the good"? Throughout the world, and particularly in the global south, there are significant barriers to mental health services, including cost, stigma, a lack of privacy where therapy is offered, and a lack of compassion and sensitivity from poorly trained medical staff. In this gap, Photovoice, a participatory methodology that encourages survivors of sexual violence to reflect on and document their experiences using cameras and recordings has been developed to give the survivors a voice.

PLENARY SESSION PRESENTATIONS

Unlocking Understanding: Helping Novice Practitioners Explain Neurofeedback in Clear and Simple Ways

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Are you interested in providing neurofeedback but uncertain where to start? In this presentation, we will provide a beginner's guide to brain training and demystify the process of neurofeedback. You don't have to be a neuro guru to use neurofeedback, we'll show you how to make it simple.

We will begin with an overview of neurofeedback, including its history and the ways it creates changes in the brain's white and gray matter. We will also examine the different applications of neurofeedback, including managing symptoms related to stress, improving focus and attention, and better regulating mood and behavior.

Next, we will provide hands-on demonstrations to show you how to conduct a neurofeedback session, including setting up the equipment, applying sensors to the scalp, and interpreting the data.

You will learn to understand the basics of neurofeedback, identify the various types of neurofeedback equipment and technology, and how to conduct a basic neurofeedback session.

Based on the content of this presentation, the participant will be able to interpret the data gathered during a neurofeedback session, incorporate neurofeedback into an existing healthcare or wellness practice, and understand the applications of neurofeedback in brain training.

We will also discuss best practices for integrating neurofeedback into a healthcare or wellness practice, including how to introduce the concept to clients, set up a session, and incorporate it into existing care plans. This presentation will also provide professionals with valuable information on how neurofeedback can benefit current services by working in tandem with traditional modalities of therapy.

Incorporating neurofeedback into your practice can be a game changer for your clients, as it helps the brain learn to better regulate. When the brain is functioning better, hope and relationships are restored, and life is brighter. Don't miss out on the opportunity to add this powerful tool to your practice. Join us for this beginner's guide to neurofeedback.

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Stop the Madness! Towards a Sane Approach to Independent Components Analysis With EEG

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This talk will summarize current status of the uses of independent components analysis (ICA) in EEG and present an alternative approach to using ICA to remove artifacts related to eye and muscle activity. This approach provides automated processing with or without human intervention, consistency of results, and minimization of distortion in the cleaned EEG signals. The method employs an industry-standard ICA algorithm, in combination with well-defined decision-making rules that detect likely artifact components without requiring human judgment and without using artificial intelligence methods.

ICA is a statistical technique that has been adopted in various forms for the processing of biological signals in general, and MEG and EEG data in particular. It offers powerful capabilities in being able to identify component dipoles in the signal, using a blind separation technique. Based on multiple iterative passes, ICA teases out the most powerful single dipole sources and finds the amplitude of each source in each channel. In doing so, the process by definition will detect the effects of volume conduction, effectively reversing the forward projection of potentials from the brain to the scalp.

When using ICA to clean EEG signals, the process consists of computing the ICA and the associated mixing matrix, selecting which components to remove (“zero out”), and then computing the reverse transformation to recover the cleaned EEG signal. Approaches to use of ICA fall along two basic lines.

One is to present the ICA components in a graphical or topographical form and leave it to the user to determine which components are to be rejected. This leads to a process that has to be learned and can lead to errors of the types described. The various positions taken with regard to ICA are:

1. Do not use ICA
2. Use ICA and resort to human judgment to guide component rejection
3. Use ICA and resort to artificial intelligence (e.g. neural networks) to guide component rejection

The approach described here takes a different path. That is, to use ICA and to then use simple, mechanical rules to select components to be rejected, focusing on EOG and EMG-related sources only. The approach is designed to err on the conservative side, which is to retain any components in question, and not remove them from the EEG. This approach is found to provide reliably artifacted EEG signals that may include some artifacts that could be removed but are kept in for the sake of avoiding erroneous rejections ("don't throw out the bathwater with the baby").

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Abnormal Pediatric EEGs and Neuroanatomy: Autism, Learning Disabilities, and Developmental Trauma

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The most common childhood pathologies of dyslexia, dyscalculia, attention-deficit/hyperactivity disorder (ADHD), and autism spectrum disorder (ASD) are those that enter our clinics seeking the silver bullet to change the course of their diagnosis. For this reason, it is paramount that the clinician successfully differentiates pathology for normalcy and identifies those findings that are specific to different disabilities.

The comorbidity of developmental disabilities and developmental trauma (e.g., abuse, neglect, molestation, etc.) is another level of discernment necessary for the clinician; these two sources of developmental creation, genetic and environmental, comingle and can confuse even the most skilled of us.

This lecture will cover: (a) the eight EEG profiles of attention-deficit/hyperactivity disorder (ADHD), as well as the impostor profiles of greater clinical significance that require referring out; (b) the neurobiology and neuroanatomical differences of dyslexia/dyscalculia vs. autism; (c) the EEG findings common in dyslexia and dyscalculia; (d) the EEG findings common in ASD; and (e) the most common findings in cases of childhood abuse and neglect.

The identification of physiology accompanying developmental symptoms, as well as differentiation from normal findings will serve the savvy clinician in protocol selection, montaging, and the targeting of modalities for their clients' success.

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Psychoneurobiological Correlates of Beta Activity

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Chronic stress and anxiety in everyday life can lead to sympathetic hyperactivity. This can be observed as behavioral, chemical, and neurological changes, including increased rumination, anxiety, and depression, and chemical changes in biological markers like homocysteine. There has been

increasing evidence that suggests a correlation between resting-state electroencephalography (EEG) activity and anxiety symptoms in patients. Specifically, an increase of beta (13–30 Hz) and a decrease in alpha (8–12 Hz) waves have been associated with higher states of anxiety (Hammond, 2005; Ribas et al., 2018; Tharawadeepimuk & Wongsawat, 2014; Thompson & Thompson, 2007). Furthermore, studies evaluating methods of reducing anxiety have found that a decrease in beta activity is directly correlated with lower anxiety levels (Sherlin et al., 2010; Walker, 2010). These results have been consistently verified across multiple clinical conditions (e.g., PTSD, anxiety spectrum disorders) as well as across diverse anxiety treatment methods such as from neurofeedback therapy to SSRI treatments to mindfulness and meditation, overall, confirming the relationship between beta wave activity and anxiety factors. The Neurocycle (Leaf, 1990, 2021) is a 63-day mind-directed self-help mental health program created by Dr. Caroline Leaf that is implemented in three phases of 21 days for a total of 63 consecutive days. These three phases are administered through the Neurocycle app, in which participants are directed via daily audio and video recordings through the five-step Neurocycle process of gather awareness, reflect, write, recheck, and active reach, which provide a scientifically validated framework for participants to identify, face, process, and manage intrusive toxic thoughts that cause distress, including symptoms of anxiety and depression (Idris, 2020; Leaf, 1997, 2021). The current paper presents a pilot study that assessed the Neurocycle's efficacy as a nonpharmacological mind-management therapy for people who struggle with anxiety and depression. We assessed psychometrics, blood-serum homocysteine levels, and quantitative electroencephalography (qEEG). Efficacy of the Neurocycle was demonstrated by improved psychometric self-assessment over the study. We observed a positive correlation between subject's low beta relative power and homocysteine levels. The findings validate the Neurocycle's efficacy for improving mental health as measured by behavioral, chemical, and neurological measures. Altogether, these findings support low beta's role in stress and anxiety manifestation given that its modulation significantly correlated with stress biomarkers in patients' blood samples and stress and anxiety self-assessments. Future work should expand these findings with larger datasets to confirm the ranges of healthy and maladaptive low beta.

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Literary Review on the Effectiveness of Neurotherapies in the Treatment of Complex Trauma

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In terms of clinical treatment-resistant populations, the most commonly used therapeutic interventions such as cognitive behavioral therapy (CBT) and exposure therapy have not yet been fully effective in the treatment of PTSD, developmental or complex trauma. Therefore, there is a clinical necessity and an ethical duty to find alternative ways to address these devastating lifelong symptoms, which if left untreated can develop not only into other debilitating psychological and medical conditions to the individual, which as per van der Kolk's and colleagues research ensue a significant financial cost to society at large. Recent neuroimaging advancements such as electroencephalography (EEG) neurofeedback therapy and brain/computer interaction (BCI) have contributed to a groundbreaking understanding of

brain function, and it may postulate a plausible solution to hard-to-treat clinical cases. However, neuropsychology, psychophysiology, or applied neuroscience are still unavailable from the current clinical psychology program's curriculum for present graduate-level students. Therefore, the aim of this study is to primarily investigate the effectiveness psychophysiological neurotherapies for complex trauma and to raise awareness regarding the prevalence and magnitude of the developmental and complex trauma and to promote and advance interest and further research of neurotherapies for trauma-related issues due to its potential effectiveness in therapeutic settings.

Study Design. This research was conducted with Pepperdine University library resources, more specifically, focusing on peer-reviewed journal articles from psychological databases such as PsycINFO and EBSCO Publishing online from 2016 to 2022, including the following keywords: ("neurofeedback" OR "neurofeedback therapy") AND ("trauma") AND ("PTSD" OR "post-traumatic stress disorder"). Twenty-four articles were considered for the study. Out of the preselected articles, 14 studies were excluded. Exclusion parameters consisted of eliminating those involving other comorbidities, unrelated treatments and techniques, or any non-trauma-related neurofeedback studies.

Discussion. Despite all the existing discrepancies in methodologies, procedures, and protocols in neurofeedback therapies, all studies included in this review have shown positive therapeutical results in treatment-resistant trauma patients diagnosed with complex trauma, PTSD, and/or developmental trauma.

Conclusion. In sum, all included studies show consistent results in favor of EEG-NF. One of these four reviewed studies reported significantly improved level of executive functioning and another study showed a reduction in the use of psychotropic medication for complex PTSD treatment-resistant participants. All the aforementioned studies suggest that treatment with EEG-based NF may improve PTSD symptoms in adult patients with PTSD and complex trauma.

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Fueling the Fire of Fight-or-Flight: Addressing the Psycho-Neuroimmunological Effects of Chronic and Traumatic Stress

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The immune system is a highly intelligent network of cells and organs from various body systems, all of which work together to fight illness and disease, as well as maintain internal homeostasis (Dantzer, 2018). Immunocompetent cells in the brain, called microglia, play a key role in these interactions. Microglia are involved in a wide variety of neurological processes, including nurturing and structurally remodeling neurons, monitoring the environmental conditions surrounding neurons, and protecting the brain against outside invaders (Macht & Reagan, 2018).

Chronic and traumatic stress tend to activate the immune system in a maladaptive manner, causing microglia to release inflammatory cytokines and triggering a cascade of chronic inflammation throughout the brain and body (Picard et al., 2021). This creates a cumulative allostatic burden, leading to impaired neurological processes, altered neurotransmitter metabolism, and physiological imbalances. Such alterations contribute to the pathogenesis of various mental health challenges, including chronic PTSD and other stress-related disorders (Ravi et al., 2021). Epidemiological studies have also verified comorbidities between these psychiatric disorders and inflammation-related illness, as well as elevated proinflammatory markers in the bloodstream (Hori & Kim, 2019). The molecular consequences of this stress-perpetuating cycle further amplify systemic inflammation, thus continuing the feedback loop (Miller et al., 2018).

In this session, we will review important connections between the brain and immune system, as well as potential underlying roots, mechanisms, and consequences of inflammation. We will explore how stress plays a role in the manifestation of inflammation, as well as how inflammation can contribute to and exacerbate stress-related disorders. As part of this discussion, we will cover the basic science of psychoneuroimmunology, as well as specific factors, such as the cell danger response, microglial activation, oxidative stress, mast cell activation, mitochondrial dysfunction, and chronic inflammatory response syndrome. Furthermore, we will examine both neuroimaging research and clinical findings to identify neurophysiological patterns associated with inflammation. We will also discuss other forms of testing to evaluate immune dysregulation as well as identify underlying roots and consequences.

Lastly, we will explore a variety of interventions to reduce inflammation and rebalance the immune system. This will include various forms of neuromodulation (e.g., neurofeedback, neurostimulation, photobiomodulation, etc.) as well as biofeedback training, nutritional support, supplementation, neuropeptide therapy, lifestyle interventions, and integrative psychotherapeutic methods. Such an integrative approach is important for optimizing therapeutic outcomes in individuals who have endured chronic or traumatic stress.

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Special Weapons and Tactics: Examining Collected qEEGs for the Assessment and Mental Health Implications of SWAT Personnel

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Members of law enforcement working in the community encounter a variety of trauma-related experiences (Bishopp et al., 2019). Known as occupational stressors, these events range from conflict resolution between community members to crime and violence (Eddy et al., 2021; Soomro & Yanos, 2018). Study findings continue to illustrate that occupational stressors increase the onset of physical and psychological consequences (Wild et al., 2016). If left unattended, law enforcement workers experience the negative symptoms of stress (Bishopp et al., 2019) and an overall decrease in health (Rajaratnam et al., 2011). Special weapons and tactics (SWAT) teams function as a more niche group within law enforcement and navigate situations mandating more trained and focused care such as hostage negotiations and other high-risk encounters (Avdija, 2014). Engaging in events that not only require heightened vigilance (Callaway et al., 2011) but perpetuate the exposure to harmful outcomes may exacerbate the onset of negative mental health symptoms (Papazoglou & Tuttle, 2018).

Quantitative electroencephalogram (qEEG) is a computerized process that synthesizes and analyzes raw EEG data. Researchers advocate that qEEGs are useful in recognizing diagnoses including depression (Olbrich & Arns, 2013), posttraumatic stress disorder (PTSD), and anxiety (Bandelow et al., 2017). For instance, van der Kolk (2014) states that individuals with a PTSD diagnosis typically demonstrate a combination of excessive activity in

the right temporal lobe combined with frontal slow-wave activity (p. 325). This biomarker suggests that mental functioning is inhibited due to hyperarousal of the fear center of the brain.

Mental health professionals who utilize qEEG recordings are uniquely positioned to assist with the law enforcement population. By considering both engrained cultural safeguards surrounding mental health and integrating qEEG-guided interventions (e.g., neurofeedback) can help populations subjected to traumatic and difficult events. This presentation will articulate common barriers faced by law enforcement personnel seeking out mental health services, as well as provide preliminary evidence findings of qEEG recordings performed on members of a SWAT team. The purpose of this presentation is to continue the ongoing dialogue discussing interventions that address the psychological needs of law enforcement individuals.

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LORETA Neurofeedback in the Educational Setting: A Standard Protocol to Improve Learning and Self-Regulation as a Method for Student Success in Post-Covid Recovery

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Learning is the most important process for human development. In the educational setting, numerous problems have been emphasized because of policies and procedures related to the COVID disruptions, including significant disruptions to traditional modes of learning, with many students struggling to adapt to online or remote learning environments. Studies have found that students have experienced learning loss during the pandemic, with lower achievement scores in subjects such as math and reading (Hanushek et al., 2021; Kuhfeld et al., 2021); negative impacts on the mental health of students, with increased levels of anxiety, depression, and stress reported (Loades et al., 2020; Zhou et al., 2021). This is particularly true for students who were already struggling with mental health issues before the pandemic; reduced socialization for many students can impact their social and emotional development. Studies have found that students have experienced increased feelings of loneliness and isolation during the pandemic (Marques de Miranda et al., 2020; Stickley & Koyanagi, 2021). LORETA neurofeedback at precuneus (Cannon et al., 2014; Cannon et al., 2018) was employed in a high school setting with 20 students (15 female) with mean age 16.00, *SD* = 1.37, selected by administration and counseling staff to complete 20 sessions on 20 consecutive school days. Logistical parameters were coordinated by administrative, counseling and teaching staff. The Conners CPT-3 and adolescent version of the Personality Assessment Inventory (PAI-A) were utilized as pre–post outcome measures. Repeated measures analysis of variance showed significant reductions on the scales of the PAI-A and improvements on the CPT-3. Standardized LORETA (sLORETA) showed significant shifts in alpha current

source density levels in posterior cingulate, precuneus, and parahippocampal regions, primarily favoring midline and left hemisphere. It is feasible to include neurofeedback in the school setting to aid in student success and reduce problematic stress and associated experiences to improve the educational environment for both students and staff.

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A Useable Guide to Medication and the EEG

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The number of people taking psychiatric medication in the United States has been on the rise year over year and was only exacerbated by the COVID-19 pandemic. According to the CDC, the number of people taking psychiatric medication increased from 15.8% in 2019 up to 24% in 2020. While numbers vary state to state, some states saw an increase in psychiatric medication use of 17% during that time. While it is hard to measure, this number has likely gone up in the 3 years since. As neurofeedback practitioners, we typically work in the intersection of neurological function and mental health. As such, we often find ourselves trying to interpret functional neurological data that may be impacted by one or more common psychiatric medications. This can make interpreting the EEG and helping the client to regain mental and neurological health, a tricky endeavor. With so many people taking psychiatric medications now, we are sometimes forced to interact with aspects of healthcare that are beyond our scope of practice. Building on the work of Kaiser, Gunkelman, Swatzyna, and so many other great minds in our field, our goal is to create and present an easy-to-reference practical guide that will help neurofeedback practitioners recognize common medication effects, use EEG data and phenotypes to inform decisions regarding medications, and stay within their scope of practice. We will cover common EEG phenotypes and how to recognize them, and then discuss how they respond to various medication choices, citing both published research and clinical experience. The data will be broken down by medication class, citing common medications, their EEG effects, noted side effects, and half-life. We will also include an easy-to-reference guide to understanding how medication affects the EEG, and how to interpret results when medication is present. Finally, we will provide guidance on how to ethically stay within scope of practice and how best to approach the subject of medication when it is outside your scope.

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LORETA Neurofeedback at Precuneus: Self-Regulation as a Tool for Reducing Recidivism in a Population of Inmates With Substance Use Problems

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Introduction. The rate of recidivism for drug and alcohol offenders is estimated at 25% within 3 years of release, with half of all incarcerated individuals projected to meet criteria for a substance use disorder (Chandler et al., 2009). The data presented are from an ongoing 3-year effort to address self-regulation via brain computer interface to aid in the reduction in recidivism with inmates with substance use issues. LORETA neurofeedback at precuneus was implemented for improving psychological status in inmates in the Newaygo County, Michigan Jail for substance abuse related offenses (Cannon et al., 2009; Cannon et al., 2014). It has been proposed that one in five incarcerations are drug related offenses.

Methods. This group data consists of 30 participants (16 female) with mean age 35.34, *SD* = 9.36. Participants completed initial screening and informed consent prior to inclusion in the learning paradigm. Participants were administered the personality assessment inventory (PAI) and self-perception/experiential schemata assessments pre training and completed 5-min eyes-closed (ECB) and eyes-opened (EOB) baselines with EEG education and training prior to beginning the LNFB protocol. Sessions were conducted five times per week across 20 consecutive weekdays. Each session consisted of six 5-min training rounds and required approximately 50 min to complete. The PAI was administered at session 19 for pre–post comparison. A repeated measures ANOVA was conducted for PAI scores and paired contrasts were conducted on EEG spectral data and LORETA current sources.

Results. There were significant overall effects for reductions in nearly all scales on the PAI with the repeated measures ANOVA with Greenhouse-Geiser correction. Brain areas showing significant differences in alpha current source density posttraining included Brodmann Areas 9, 10, 24, 20, 21, 22, 32, and 36. Reductions in posttraining arrest are significant with 73% not returning to the facility postneurofeedback.

Discussion. The current program is focused on improving self-regulation using LORETA neurofeedback standard procedures in the local jail at Newaygo County, Michigan, to reduce recidivism rates. There have been research studies that have shown small to uncertain effects in prison and jail populations (Perry et al., 2019). Alternatively, other authors propose treatment models during incarceration have offered some level of efficacy (Peters et al., 2017) with initial treatment and longer term monitoring. These type of studies and active interventions in county jails may aid in the reduction of recidivism as well as decrease the rates of overdose related deaths shortly after release (Becker et al., 2020; Davis et al., 2020; Kim & Yang, 2020; Oluwoye et al., 2020; Rushovich et al., 2020). Current results do show relative success in improving the recidivism rates among this population in Michigan.

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Neurotypical Pediatric EEGs and Developmental Neuroanatomy

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Analyzing adult EEGs is a more familiar practice to the general clinician than analyzing children's EEGs. Yet many cases that most desperately need the services of neurotherapy clinicians are those of learning disabilities, developmental traumas, autism spectrum disorders, and the like. It is paramount that we can differentiate normal findings in healthy pediatric EEGs from abnormal, in order to target and customize protocol selection for the best interests of our children clients and their parents.

This lecture covers the findings in the normal EEGs of children from in utero to adolescence, in a chronological fashion. From the strategic encoding of DNA that established the resting-state networks early in the womb to the fundamental networks and their interactions, this talk will impart information on the aperiodic noise under the brain's rhythms (brown and pink noise in the human EEG), the bases of paralinguistics, nonverbal, and declarative language development, as well as neuroanatomical areas of import in healthy early attachment.

The healthy child's psychological milestones, behaviors, and oddities will discussed in connection with the EEG findings that—while abnormal in a mature EEG—are normal in a child's EEG (e.g., spikes, mu rhythm, slow content, etc.). Finally, this lecture will identify false positives, areas of anomaly that are often misinterpreted as normal. This lecture will serve the beginner and advanced clinician alike.

This lecture is part one of a two-part lecture, the other being on abnormal pediatric EEGs: autism, learning disabilities, and developmental trauma. While it is not imperative that clinicians attend both lectures, the contrast between heathy and abnormal EEG and anatomical structures is subtle and meaningful.

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