the Neuroconnection News

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The Benefits of Connectivity-Guided Neurofeedback for **Depression**

Since 1949, *Mental Health Awareness* is given annual recognition to promote nation-wide collaboration for the individuals, families, and friends affected by the growing prevalence of mental health disorders. Every year, organizations like Mental Health America (MHA) and National Alliance on Mental Health (NAMI) advocate across the country to inform the public, challenge the stigmas, and promote equal care for the millions of individuals living with a mental health condition. The goal is to build awareness and a better understanding of mental illness in an ultimate effort to increase access to treatment and encourage early intervention for those who are struggling.

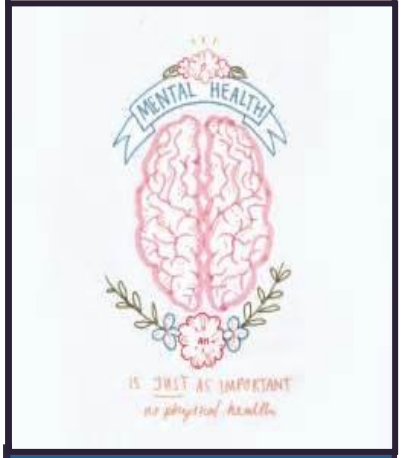
Over the past 16 years, The Neuroconnection has strove to support such a goal. As a neurofeedback practice, mental illnesses are frequently presented concerns. Whether treating a child with school phobia or an adult overcoming addiction, our professionals have successfully addressed symptoms within a wide range of mental health concerns across all ages. With the use of innovative Connectivity-Guided Neurofeedback (CGNFB), intervention can enhance neuroregulation and improve the brain's ability to function.

In application of mental health, particularly significant improvements have been observed when using CGNFB to address symptoms of *Depression*. Confirmed as the leading cause of disability worldwide by the World Health Organization (WHO 2017), depression ***globally affects more than 350 million people of all ages.***

In this month's newsletter we bring to you an overview of depression and the classification of depressive disorders, connectivity and EEG abnormalities within the depressed population, and how CGNFB addresses functional deficits in the brain that may be contributing to depressive symptomology. Evidence-based research is also provided to further illustrate the efficacy of neurofeedback training for treatment of depression. To conclude this issue, we discuss a case study demonstrating how CGNFB has provided success for a particular patient with depression here at The Neuroconnection.

Upon reading this newsletter, if you have any questions or would like to request additional information, please feel free to contact us at (630) 858-5105.

In This Issue:



Overview: *Depression and Depressive Disorders*

Depression is a broad term for severe mood dysregulation lasting two or more weeks. It is a condition known to affect somatic and cognitive changes that serve to negatively impact one's capacity to function. An individual with depression may experience symptoms ranging through:

Persistent sad or anxious mood
Sleep disorder (insomnia or hypersomnia)
Loss of interest (anhedonia)
Guilt or feelings of worthlessness
Increased irritability
Thoughts of death or suicide
Psychomotor changes
Appetite disorder with weight gain or loss
Inhibited concentration
Energy deficit (fatigue)

In order to help distinguish between particular onsets and presenting symptoms, a diagnosis may be further specified into the following *depressive disorders:*

Major Depressive Disorder (MDD)
One of the most common forms of depression characterized by a two-week period in which 5 or more of the above symptoms are present. Depressive episodes can occur once or twice in a lifetime, or may recur frequently. They may also take place spontaneously after or during the death of a loved one, a medical illness, a romantic breakup, etc.

Persistent Depressive Disorder (PDD)
Another common form of depression in which *episodes of major depression* present less severely, but last for a minimum of two years.

Seasonal Affective Disorder (SAD)
Categorized by depression that is onset during the winter months, specifically when there is less natural sunlight. While symptoms tend to lift during spring and summer, it is typical for *social withdrawal, increased sleep,* and *weight gain* to return every year in those with SAD.

Perinatal Depression (PPD)
Severe depression in women that generally onsets within 4 months of labor and/or following delivery. Symptoms of *extreme sadness, anxiety, and exhaustion* not only impede a new mother's ability to care for herself and/or child, but may also activate severe ruminations or psychotic features that significantly increase risk of harm to their child.

Disruptive Mood Dysregulation Disorder (DMDD)
The presentation of children with persistent irritability, anger and frequent, intense temper outbursts. Set apart from what might be considered a "moody" child, DMDD onsets before the age of 10 to affect severe impairment in children that often requires clinical attention.
**DMDD is relatively new and widely debated diagnosis intended to prevent over-diagnosis of bipolar disorder in children.

NOTE: **Bipolar Disorder** is a distinct diagnosis from depression. While extreme low moods may meet the criteria for major depression, an individual with bipolar disorder also experiences extreme high, or euphoric, states referred to as "mania," or a manic episode.

Please keep in mind this is a summary of criteria listed for informational purposes. This list is not meant for self-diagnosis. If you, or a loved one, are experiencing the above symptomatology, please contact your primary care physician for diagnosis. <u>If you are experiencing any type of suicidal ideation, please contact 911 immediately.</u>

Reference: National Institute of Mental Health. Depression. Retrieved from https://www.nimh.nih.gov/health/topics/depression/index.shtml

Neurophysiology of Depression:

Treating Depression Means First Treating the Brain

While it has been estimated that approximately 80-90% of depressed patients can be treated successfully, more than half of individuals with depression are either misdiagnosed or undiagnosed to begin with and, respectively, struggle with symptoms that continue to be undertreated or never addressed at all. For those who have received an appropriate diagnosis, anti-depressants are typically implemented as the current standard of care. However, considering the variability within the depression diagnosis itself, not to mention the range of potential side effects and responses in tolerance to such drugs, antidepressants have frequently proved to wane in effectiveness, and may even pose a greater risk to a patient than no treatment at all. In an effort to address these uncertainties, expanding research has begun to outline the neurological disparities present in the brain of a depressed individual.

WHAT: Neurological Asymmetry

Through advancements in neural imaging, researchers have been able to discern a significant correlation between depression and ***asymmetric activity across the prefrontal cortex*** of the brain (Brody et al 2001).

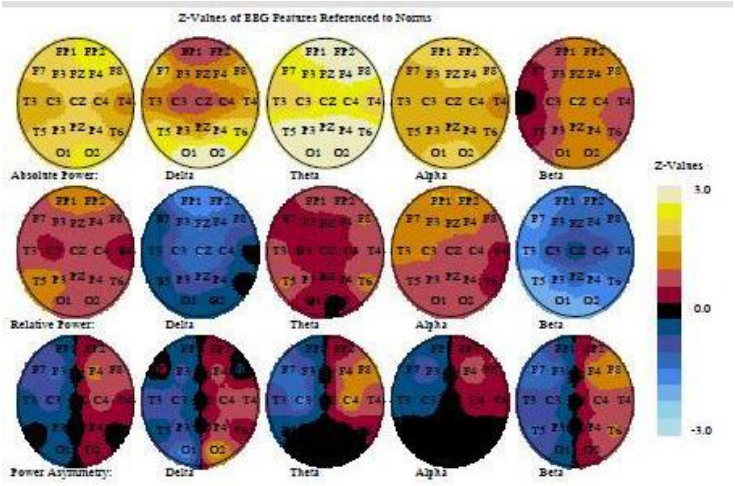


Figure 1 - Nx-Link QEEG brain maps of an elderly male suffering from severe depression. Note the excessive relative power in alpha band in the left temporo-frontal region.

Using electroencephalogram (EEG) testing, Henriques and Davidson (1990) became the first to recognize the lateralized pattern of electrical activity within frontal regions of the brain that was unique to those diagnosed with depression. At a closer look, the asymmetry was determined by ***elevated alpha (8-12 Hz)*** relative power measured from the left frontal lobe. Considering alpha and cortical activity are inversely related (Davidson 1988), the abnormality found in the majority of depressed patients is defined as ***left frontal hypoactivity respective to right frontal hyperactivity.***

While continuing research supported consistent neurological findings in individuals with depression (Jacobs & Snyder 1996), further investigation was needed to determine whether this frontal asymmetry could be causally involved with depressive symptomology and, if so, how.

For more information pertaining to the findings noted above, please review the references below:
Mueller, H. H., Dr.. Findings from Brain Imaging Studies. Retrieved from http://www.edmontonneurotherapy.com/treatment_depression.html
Walker, J., Lawson, R., & Kozlowski, G. (2007). Current Status of QEEG and Neurofeedback in the Treatment of Clinical Depression. *Handbook of Neurofeedback,* 341-352. doi:10.1201/b14658-1

Neurophysiology of Depression:

Treating Depression Means First Treating the Brain

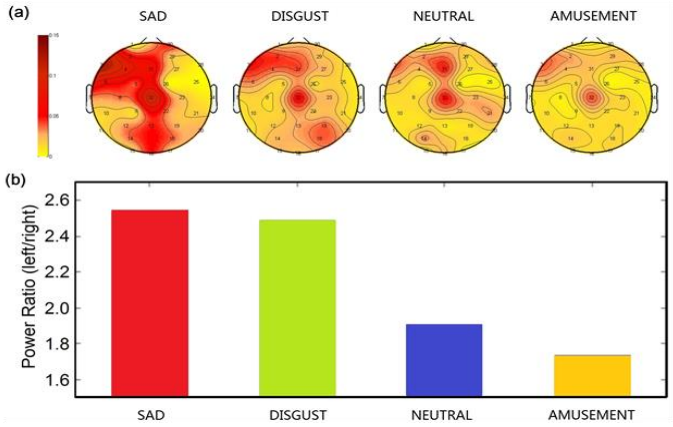
HOW: Neurological asymmetry impacts emotional processing

According to a study conducted by Davidson and Irwin (1999), emotional processing in the brain may also be recognized laterally. While the neural structures known to process emotion incorporate both the right and left hemispheres, an approach/withdrawal dimension is theorized to distinguish the type of emotions that are generated from each side.

With increased right-hemispheric activation, the study observed elevations in emotions categorized as "withdrawal" behaviors including fear, sadness, and depressive tendencies. Heightened left-hemispheric activation, however, elicited a classification of "approach" behaviors, increasing emotions such as happiness, as well as feelings of interest and reward. By confirming a causal relationship between lateralized cortical activity and emotional response, the results suggest that frontal asymmetry could be responsible for the overarching symptoms seen in patients with depression.

Since we now know *hyper*activity in right frontal regions enables respective increases in "withdrawal" behaviors, we can identify this same abnormality found in individuals with depression as a key contributor to the symptoms of *escalated* negativity, such as sustained anxiety or frequent irritability. In the same context, *hypo*activitation on the left side of the brain corresponds to decreased "approach" behaviors, recognized as the source for common symptoms, like *loss* of interest or energy, in depression

Analyzed EEG data collected from nine participants using validated film clips to induce four different emotional states (Valenzi et al 2014)



a) Average of participants' EEG power spectrum in alpha band (8 – 13 Hz) among stimuli to four emotions. In frontal areas clear EEG power spectrum differences are evident among all conditions. (b) Ratio of average of participants' EEG alpha power spectrum measured in left frontal electrodes (AF3, F7 and F3) over right frontal electrodes (F4, F8 and AF4) during the four categories of emotional stimuli used in the study.

These findings with respect to depression are quite consistent, emphasizing the general notion that *abnormal activity in the EEG reflects psychopathology* and, conversely, *normalizing the EEG can improve brain function and reduce psychopathology.*

(Vakalopoulos 2014)

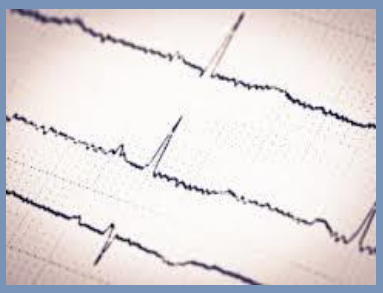
For more information pertaining to the findings noted above, please review the references below:

Valenzi, S., Islam, T., Jurica, P. and Cichocki, A. (2014) Individual Classification of Emotions Using EEG. *Journal of Biomedical Science and Engineering*, **7**, 604-620.

Davidson, R. J., & Henriques, J. B. (2000). Regional brain function in sadness and depression. In J. Borod (Ed.), The neuropsychology of emotion (pp. 269–297). New York: Oxford University Press

Vakalopoulos, C. (2014). The EEG as an index of neuromodulator balance in memory and mental illness. *Frontiers in Neuroscience*, *8*, 63.

CGNFB at The Neuroconnection



With the use of Connectivity-Guided Neurofeedback (CGNFB), research has demonstrated the power of neuroplasticity to address the asymmetric abnormalities within the brain induced by the genetic and environmental factors leading to depression. Here at **The Neuroconnection,** our team utilizes quantitative EEG analysis to identify patterns of electrical activity that differentiate from the standard, "healthy"

norms. Our analysis not only takes into account **power**, but also reveals any **connectivity abnormalities** present across areas of the brain that may also be contributing to negative symptoms associated with depression. Any discrepancies detected by the QEEG help our professionals to determine a distinct CGNFB protocol to implement for neurofeedback training that will most effectively address the areas of concern. As the most advanced form of training to-date, Connectivity-Guided Neurofeedback works to measure connectivities across regions of the brain in three dimensions, which has been proven far more accurate than traditional neurofeedback. By reinforcing changes through operant conditioning in targeted areas of the brain, CGNFB is able to exercise and strengthen brain communication, thereby decreasing correlating symptoms. Treatment with CGNFB is non-invasive, with none of the adverse side effects otherwise experienced with medications. Our experts also recognize the significant impact of individual factors on a patient's cognitive changes and are careful in developing comprehensive plans that take these into consideration when applying CGNFB.

The Neuroconnection has achieved the following results, with respect to Depression:

- ✓ Improved mood and/or affect
- ✓ Return of interests and/or enjoyment in life
- ✓ Decreased vegetative symptoms including:
  - Improved sleep
  - Increased energy
  - Improved appetite
  - Increased concentration

Evidence-Based Research:

Efficacy of Neurofeedback in Patients with MDD

A recent study was conducted to demonstrate the significant impact of neurofeedback training on individuals with Major Depressive Disorder (MDD). Considering the correlations between deficits within left frontal regions and depression, this study assessed the efficacy of neurofeedback training that incorporated left prefrontal beta training in conjunction with inter-hemisphere alpha/theta training as a modality for treating MDD.

The study selected twenty individuals, all 18 years or older, who had received a clinical diagnosis for MDD. Participants were to complete two or three training sessions each week, for 8 weeks, which comprised of beta training for 30 minutes over frontal placement F3, followed by 30 minutes of posterior alpha/theta training at Pz. EEGs were obtained and compared before and after treatment, along with a number of clinical assessment scores including the Hamilton Depression Rating Scale (HAM-D), Hamilton Anxiety Rating Scale (HAM-A), Becks Depression Inventory-second edition (BDI-II), Beck Anxiety Inventory (BAI), and the Clinical Global Impression- Severity (CGI-S). All clinical measures were administered during the course of treatment at week 4, as well (refer to Figure 1 below).

*Upon completing 8 weeks of neurofeedback training, analysis of pre and post scores revealed that participants made significant improvements within **all** assessments measured.*

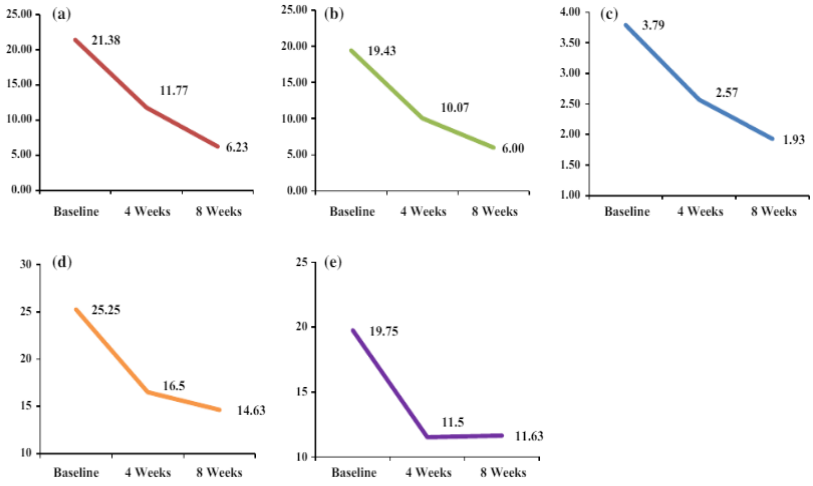


Figure 1 - Neurofeedback effectiveness in accordance to clinical assessments: **a.** HAM-D, **b**. HAM-A, **c**. CGI, **d**. BDI, **e**. BAI

Post HAM–D scores, specifically, indicated **75% of participants identified with less than half of the depressive symptoms reported on their baseline assessment,** with **55% qualifying for remission** (meaning they were no longer considered clinically depressed)**.**

Further comparison also showed substantial decreases in anxiety symptoms and clinical illness severity following neurofeedback training.

Reference: Cheon, E., Koo, B., & Choi, J. (2015). The Efficacy of Neurofeedback in Patients with Major Depressive Disorder: An Open Labeled Prospective Study. *Applied Psychophysiology and Biofeedback, 41*(1), 103-110. doi:10.1007/s10484-015-9315-8

The Neuroconnection Case Study: Success for Depression

Since 2001, the Neuroconnection has been aiding patients to mitigate symptoms of depression with Connectivity–Guided Neurofeedback (CGNFB).

One success story, in particular, began with Ally. The 25-year-old was referred to the Neuroconnection by a former client who had experienced relief symptoms of anxiety and depression, similar to Ally's, after beginning neurofeedback. Ally first contacted our office in hopes of alleviating a number of presenting concerns including poor mood, social anxiety, withdrawal, low motivation, emotional sensitivity, and trouble sleeping. During the initial intake appointment, she detailed the circumstantial stressors of searching for a job weighing over existing grief after her recent loss of a loved one. Since Ally had a history of anxiety and depression since the age of 12, she began Prozac (an antidepressant belonging to a group of selective serotonin reuptake inhibitors (SSRIs)) in high school to help regulate her emotional and cognitive control. However, within the past few years, Ally noted her symptoms had steadily started to resurface, and were quick to impede her daily social and collegiate activities. Despite increasing dosages and altering medications, Ally reported she felt as though "medication no longer work[ed]" and was eager to explore other options.

Upon starting at The Neuroconnection, initial Beck's Inventories determined Ally suffered from *high anxiety and moderate depression* with self-reported scores as high as 41 and 22, respectively. This was confirmed by a QEEG administered to identify the neurological abnormalities that could be contributing to Ally's distress. As expected, interpretation of *Ally's data revealed frontal asymmetry, with elevated alpha and respective hypoconnection in the left hemisphere* (See Figure 1 below). Her subsequent neurofeedback protocol designated training to the left frontal side in order to inhibit excess alpha power and upregulate connectivity across the region.

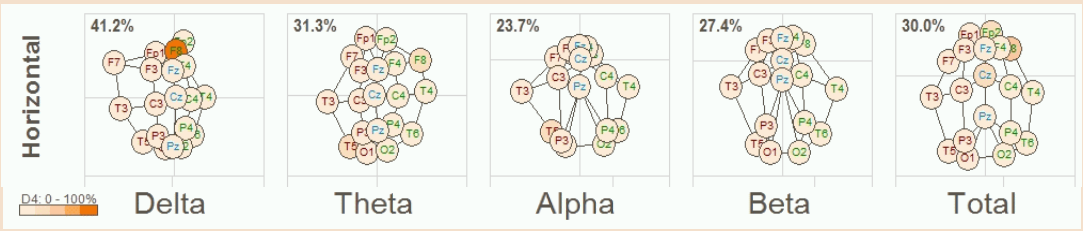


FIGURE 1 Connectivity image generated from eyes open data collected from Ally's first QEEG mapping. Graphic representation helps to illustrate frontal asymmetry in delta through alpha frequencies.

****Names and dates have been changed to maintain confidentiality*

The Neuroconnection Case Study continued…
Success for Depression

Following 10 sessions of neurofeedback, Ally observed drastic improvements with a number of her presenting symptoms. Updating her Beck's inventory scores, Ally now categorized with *mild, as opposed to moderate, depression*, and *anxiety symptoms had decreased by more than 50%*. After just 5 weeks of training, Ally reported improved concentration, increased motivation, clearer thinking with less obsessive thoughts, and better organization. While she was pleased with the progress made thus far, Ally also recognized several significant symptoms, including low mood and difficulty sleeping, which still presented concern.

Continuing neurofeedback training, Ally's 2nd protocol was directed to target her depressive symptoms. Completing another 10 sessions, she not only experienced improvements with depressive thoughts but also noted further progression with motivation, reporting "[I] am finally wanting to get things done." While Ally mentioned falling asleep still proved difficult, once asleep, she was now able to remain asleep through the night, which was otherwise rare prior to beginning her 2nd protocol. Beck's inventories continued to confirm advancements with Ally's anxiety and depression scores dropping to 16 and 9, respectively.

Encouraged by her results thus far, Ally followed up with a 3rd and 4th protocol. Following her next set of 10 sessions, concentration and motivation were "a world better," Ally noted. Within the past 5 weeks, she had not only found and landed a part-time job but also began taking more initiative to do things she actually enjoyed, such as spending time with her friends. More importantly, Ally mentioned finally having a positive outlook on her future plans and goals.

Over the course of her total 40 sessions, Ally's Beck's anxiety and depression inventories fell to 6 and 3, respectively (See Table 1). According to Beck's scales, Ally's presenting concerns now classified her with low anxiety and depressive symptoms minimal enough to be considered "normal ups and downs." The Neuroconnection could not be happier to share the results of Ally's experience with CGNFB, as she is only one of many who have been helped with depression at our clinic. With the long-lasting results from training, we are confident that Ally now has the drive and peace of mind to continue reaching towards her ultimate potential.

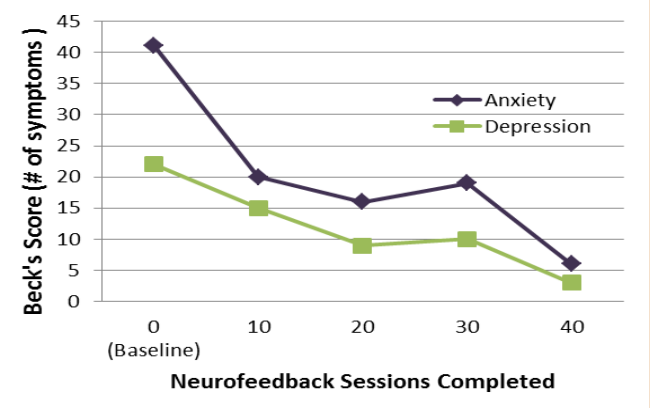


TABLE 1 Trend of Ally's scores on Beck's Depression and Anxiety Inventories over the course of her neurofeedback training

****Names and dates have been changed to maintain confidentiality*

@ Home Training through The Neuroconnection

Upon seeing such excellent results in the past 9 years with Connectivity-Guided Neurofeedback (CGNFB), our professionals aimed to extend access to training for those outside of our geographic area or inflexible schedules. As a result, The Neuroconnection designed an @ Home Training program to offer CGNFB sessions in the convenience of your home. For 5 years, we have been able to provide our expertise and therapeutic treatment to families across the world. The opportunity for daily neurofeedback training at home has brought successful results for clients living as far as Russia and India.

The @ Home Training program begins with an initial intake, along with a QEEG or "brain map" at our Naperville location. A custom protocol is then determined for the specific needs of the client. At this time, an extended training session is scheduled in-office to instruct clients and/or families how to run a session on their own. Clients are given all the necessary tools and equipment to loan for in-home use, a laptop that has been pre-loaded with the software and protocol required to conduct sessions, Atlantis amplifier, electrodes, head cap to show correct placements, and an @ Home Training manual.

Following the in-office training appointment, clients are monitored during in-home sessions via Skype to answer any follow-up questions and verify that CGNFB training is running smoothly. Once training with the software becomes comfortable, clients may begin to run sessions at their own convenience while professionals at The Neuroconnection continue to monitor progress remotely via email. One protocol for home unit training consists of 20 sessions, with at least two sessions ran each week. Upon completion of a protocol, clients have the option to return to our office for a QEEG remap to quantify pre and post comparisons, or to discontinue training if desired results have been achieved.

The Neuroconnection @ Home Training brings Connectivity-Guided Neurofeedback to the convenience of your home.

Call (630) 858-5105 now to find out more!

Learn more about The Neuroconnection's director:

Ann L. Rigby, MSW, LCSW, BCN has over 30 years of experience in the mental health field. She has specialized training and extensive experience in the areas of Autism, Attention Deficit Hyperactivity, Anxiety, and Mood Disorders. Ms. Rigby has been providing Neurofeedback services since 2001. She founded "The Neuroconnection", a Brain Mapping and Neurofeedback clinic that provides an advanced, research-based form of Neurofeedback known as Connectivity-Guided Neurofeedback.

Ms. Rigby is the Past Board Chair for the Autism Society of Illinois. She is a fellow and Board Certified member of The Biofeedback Certification International Alliance. She is also a field placement instructor for graduate students at Benedictine University and holds memberships with the International Society of Neurofeedback and Research (ISNR), the Biofeedback Certification Institute of America (BCIA), and the National Association of Social Workers (NASW).

Ms. Rigby is a frequent speaker and exhibitor at many national and regional conferences throughout the year on topics related to the benefits of Connectivity-Guided Neurofeedback. Some of her recent speaking engagements included: The 2016 American Academy of Pediatrics – 2nd Annual Autism, Behavioral and Complex Medical Needs Conference, The AutismOne 2016 Conference, The 46th Autism Society of America National Conference, The 2015 Family Time Magazine Autism and Special Needs Seminar, The Illinois Special Needs Expo, Options Center for Independent Living Annual CIL Empowerment Seminar, and Cornerstone Services Annual Mental Health Seminar.

To learn more about up and coming speaking engagements, go to our website www.theneuroconnection.com and visit our Resources tab.

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