

the **Neuroconnection** News

December-January 2016

Edition 2, Volume 5

The Gift of Learning for Individuals with a Learning Disability

Season's greetings! The most wonderful time of the year has finally arrived. However, for some individuals, the stress of finding the perfect gift for a loved one can be a daunting process. For this reason, the professionals at The Neuroconnection would like to propose the **gift of learning** this year through the use of Connectivity-Guided Neurofeedback. Education is a gift that can pay rich rewards through the New Year and well beyond.

When a child begins to exhibit significant difficulties in academic achievement and related fields of behavior and learning despite no indication of a medical, environmental, or psychiatric cause, he or she may be suffering from a **learning disability**. According to the State of Learning Disabilities, approximately 2.4 million public school students in America identify with a learning disability under the Individuals with Disabilities Education Act (IDEA). Since "learning disability" is a general descriptor for a wider range of specific problems, the effects and presenting symptoms vary greatly from person to person. An individual may show signs of struggling with anything from reading comprehension to mathematical computations to critical reasoning. In any case, learning disabilities not only impede upon one's academic life, but can also affect a child's social behavior and mental health.

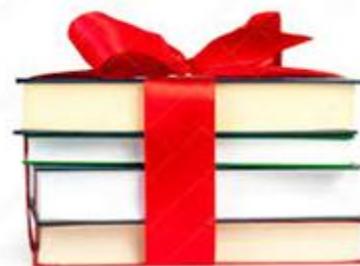
While it may be difficult to face the possibility your child may have a learning disorder, early recognition and management of symptoms are key to preventing further stress in his or her life. Some worry that by calling attention to learning problems their child may be assigned to a less challenging class or even bullied by their peers for being "slow". However, it is important for you and your child to remember that having a learning disability does not mean he or she is any less intelligent. **Learning disorders are neurological conditions** that interfere with an individual's ability to receive, process, and store information. These inhibited pathways within the brain are what give rise to the difficulties in a child with a learning disorder experiences - not a lack of intellect or motivation. Although there is no "cure" for learning disabilities, with the right guidance at home and school therapies like Neurofeedback have proven very effective in addressing the underlying neurological abnormalities that contribute to such disorders.

With the use of Connectivity-Guided Neurofeedback, the professionals at The Neuroconnection have successfully been able to address a wide range of symptoms for those with learning disabilities. Taking advantage of the most state-of-the-art brain training will offer your child the gift of learning this holiday season. For this reason, we bring to you in this month's newsletter an overview of learning disabilities with a detailed look at their neurological cause, and how CGNFB can serve as a modality to address those sources. **Dyslexia** will also be reviewed in-depth, including evidence-based research behind results with Neurofeedback. Finally, a case study from The Neuroconnection demonstrating how CGNFB has provided success for a client with a learning disability concludes this issue.



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What is a Learning Disability?

A learning disability is a processing deficit affecting a person's ability to speak, read, write, calculate, think, focus, or listen. There is a disconnect between overall intelligence and academic achievement or ability to progress in one or more specific areas. Although learning disabilities occur in very young children, the disorders are usually not recognized until the child reaches school age. Research shows that 8 to 10 percent of American children under 18 years of age have some type of learning disability. Students with a learning disorder can often be considered hyperactive or inattentive, however the underlying problem may not be an intellectual or behavioral one. Rather, the brain of a child with a learning disability is wired differently, affecting the way they receive and process information. This can lead to trouble with learning new skills having the ability to put them to use effectively.

The most common types of learning disabilities involve problems with reading, writing, math, reasoning, listening, and speaking:

Common Types of Learning Disabilities		
Dyslexia	Difficulty reading	Problems reading, writing, spelling, speaking
Dyscalculia	Difficulty with math	Problems doing math problems, understanding time, using money
Dysgraphia	Difficulty with writing	Problems with handwriting, spelling, organizing ideas
Dyspraxia (Sensory Integration Disorder)	Difficulty with fine motor skills	Problems with hand-eye coordination, balance, manual dexterity
Dysphasia/Aphasia	Difficulty with language	Problems understanding spoken language, poor reading comprehension
Auditory Processing Disorder	Difficulty hearing differences between sounds	Problems with reading, comprehension, language
Visual Processing Disorder	Difficulty interpreting visual information	Problems with reading, math, maps, charts, symbols, pictures

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

Kemp, G., Smith, M., & Segal, J. (2015). Learning Disabilities and Disorders. Retrieved November 10, 2015, from <http://www.helpguide.org/articles/learning-disabilities/learning-disabilities-and-disorders.htm>

Results with Connectivity-Guided Neurofeedback:

Fortunately, it is possible to identify underperforming areas of the brain through QEEG brain mapping and use this information to train an individual's brain to change the wave pattern. The Neuroconnection utilizes the most effective form of this therapy, known as Connectivity-Guided Neurofeedback (CGNFB) to address learning disabilities. With CGNFB application our professionals have and continue to see improvements in:

- Reading comprehension, math performance, writing, spelling and organization
- Cognitive and academic performance
- Increased concentration, planning and organizational ability
- Ability to complete homework and class assignments
- Phonetics and semantic language

Neurobiology of Learning Disabilities:

According to the National Center for Learning Disabilities, learning disorders are the product of neurological “glitches” that are unique to an individual. The structural or functional discrepancies within the brain may occur during fetal development and/or early childhood years. With the use of sophisticated brain imaging techniques of modern technology, a number of regions and structures have been linked to specific skills that contribute to the learning process.

In an analysis by Ashkenazi et al 2013, neurological biomarkers were identified for both math (MD) and reading (RD) disabilities using previous structural and functional imaging studies.

Overall, the findings indicate individuals with MD display decreased activation within the bilateral intraparietal sulcus (IPS) and frontal gyrus (FG) in posterior regions. Deficits within this circuit are thought to lead to the inhibited non-symbolic processing, symbolic comparison, and arithmetic problem solving seen with MD (Figure 1).

Deficient pathways for RD were instead isolated to left hemispheric regions within inferior frontal gyrus (IFG), inferior parietal lobe (IPL), and the FG. The circuits within this region are thought to underlie orthographic, phonological, and semantic processing impairments in RD (Figure 2).

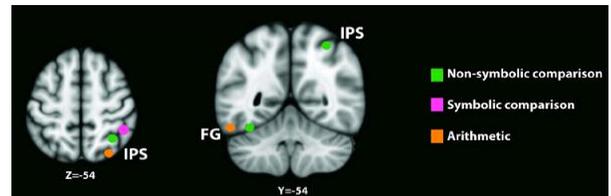


Figure 1. Brain regions that show decreased activation in MD relative to typical TD during non-symbolic comparison (Price et al. 2007), symbolic comparison (Mussolin et al. 2010), and an arithmetic problem solving task (Ashkenazi et al. 2012).

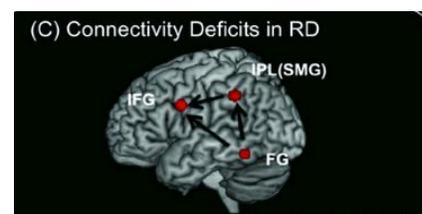


Figure 2. Connectivity analysis using casual modeling showed left FG to IPL and left FG/IPL to IFG connectivity deficits in RD (Cao, Bitan & Booth, 2008).

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

Ashkenazi, S., Black, J., Abrams, D., Hoeff, F., & Menon, V. (2013). Neurobiological Underpinnings of Math and Reading Learning Disabilities. *Journal of Learning Disabilities, 46*(6), 549-569.

CGNFB as a Modality for Dysgraphia Learning Disability:

Due to the neurological sources underlying learning disorders, Neurofeedback training has become a valued approach for remediation. Walker et al. 2012 provided evidence for its efficacy, in a study with twenty-four individuals with refractory dysgraphia. To address this disorder of written language all subjects were first administered a quantitative electroencephalogram (QEEG) to determine any discrepancies within critical writing regions of the brain. After finding excessive slow (2-7 or 8-12 Hz) and fast (21-30 Hz) wave activity in every case, all but 2 participants decided to complete a total of 5-10 twenty-minute sessions of Neurofeedback training. Before and after sessions, a score of dysgraphia was collected from each subject via a Checklist of Written Expression. This particular checklist evaluated an individual's spacing on a page, spacing of sentences, words, and letters, and slant of letters to determine a score ranging from 0-10 (0=poor, 1=fair, 2=good, etc).

Following completion of Neurofeedback training, the 22 subjects indicated an average increase in dysgraphia scores from 5.4 to 9.0 (Table 1). Conversely, the two participants who opted out of receiving Neurofeedback showed no significant changes from their pre-training scores of 5. After follow-up for 1-5 years with those who completed Neurofeedback, it was also revealed that all subjects maintained their post-training improvements.

Pre-training score	N	Post-training score (each individual)
3	2	9, 9, 9
5	12	9, 9, 9, 10, 8, 9, 9, 9, 9, 9, 9, 9
6	10	9, 10, 9, 9, 9, 9, 9, 9, 10
No training		
5	2	5, 5

Overall, scores increased from 5.4 to 9.0 on average (p<.001) Wilcoxon ranked sums and Mann-Whitney Utest. All the subjects improved significantly by self-report.

Table 1. Effect of neurofeedback on dysgraphia scores

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

Walker, J. (2012). QEEG-Guided Neurofeedback for Remediation of Dysgraphia. *Biofeedback, 113-114*

Reading Disorders

When a learning disability manifests itself to difficulties within the reading process, it is known as a reading disorder. Since there are many different classifications, and not everyone with a reading disorder will have every symptom. In general, these individuals may have problems recognizing words they already know and are often poor spellers. Additional signs of reading disorders include difficulties with letter and word recognition, understanding words and ideas, reading speed and fluency, general vocabulary skills and trouble with handwriting.

DYSLEXIA

If an individual is exhibiting such signs of a reading disorder, despite having normal intelligence, it is known as **dyslexia**. Affecting 5-17 % of the population the condition can cause these intelligent individuals to experience problems with word decoding, reading comprehension, and/or reading fluency. A basic effect of dyslexia inhibits the understanding of the relationship between sounds, letters and words, ultimately leading to complications with spelling and phonological processing. This struggle with word decoding only serves to further a secondary effect of dyslexia that inhibits one's grasp on the meaning of words, phrases, and paragraphs. Consequently, people with dyslexia often display significantly lower reading levels than age-matched peers due to this reduced reading comprehension. Some other indications of dyslexia are when an individual may:

- ❖ Require more time to read and work through information
- ❖ Need supplemental materials, such as an audiobook
- ❖ Have problems recognizing the differences between similar sounds or segmenting words
- ❖ Be unable to remember content, even if it involves a favorite video or storybook
- ❖ Problems with spatial relationships may appear uncoordinated or have difficulty with organized sports.
- ❖ Display difficulty with left and right, often dominance for either hand has not been established

Neurobiology of Dyslexia

Similar to other learning disabilities, Dyslexia is attributed to differences in neurological wiring. With the use of fMRI, brain imaging studies indicate primary deficits in left temporoparietal regions, as well as possible secondary deficits over right frontotemporal areas in those with Dyslexia. It is hypothesized these regions of the brain play a pivotal role in the neural circuit that enables reading (See Figure 3). When areas within this network are unable to receive and process information correctly due to deficits of a dyslexic brain, the phonological, semantic, and visual processing necessary for reading are accordingly inhibited.

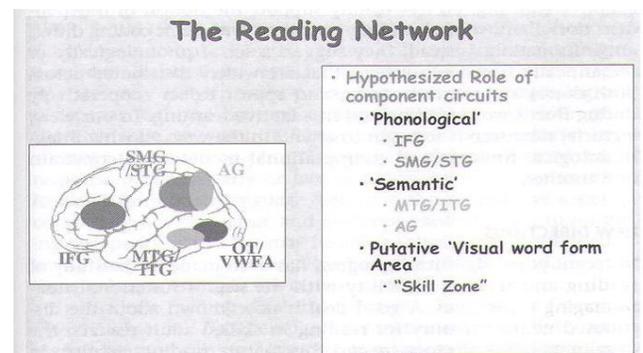


Figure 3. A schematic representation of subregions thought to be associated with different component processes in reading

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

What are reading disorders? (2014, February 2). Retrieved from <https://www.nichd.nih.gov/health/topics/reading/conditioninfo/pages/disorders.aspx>
 Robichon, F., Bouchard, P., Demonet, J., & Habib, M. (2000). Developmental Dyslexia: Re-Evaluation of the Corpus Callosum in Male Adults. *European Neurology*, 43, 233-237

Connectivity-Guided Neurofeedback as a Modality for Dyslexia: Evidence-based research

Neurofeedback Remediation for Twelve Patients with Dyslexia

Considering the neurological deficits attributed to Dyslexia, a study by Walker et al. 2007 analyzed the efficacy of Neurofeedback training in addressing symptoms of the reading disorder. The report reviewed twelve cases of individuals with Dyslexia, ages 7-16, who received 30 to 35 ten-minute sessions of Neurofeedback. Prior to training, a QEEG was first obtained from each subject in order to determine any abnormalities in electrical brain activity. Similar to findings of Arns et al. 2006, the individuals with dyslexia displayed increased slow activity (Delta and Theta) in frontal and right temporal areas, which has been previously correlated to poor reading and phonological awareness. Decreased 16-18 Hz activity (Beta-2) in the left mid-temporal region was also a present marker that has been associated with Dyslexia as well. Neurofeedback protocols were therefore assigned to help train down increased Delta and Theta and/or train up decreased Beta-2 activity according to the EEG discrepancies of a participant. After completing their respective training, all subjects revealed improvement of at least two grade levels. Follow-up QEEG recordings additionally confirmed normalized activity in frequency bands that had been addressed through Neurofeedback training.

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

Walker, J., & Norman, C. (2006). The Neurophysiology of Dyslexia: A Selective Review with Implications for Neurofeedback Remediation and Results of Treatment in Twelve Consecutive Patients. *Journal of Neurotherapy*, 10(0), 45-55.

Neurofeedback Training on EEG Coherence in Children with Dyslexia

More recently, Nazari et al 2015 also furthered support for Neurofeedback as an effective intervention for children with reading disabilities. The study followed 6 subjects between the ages of 8 and 10 with Dyslexia. After baseline reading and phonological skills tests, a QEEG recording was also taken from each child prior to training. Resulting EEG coherence scores were additionally calculated for each of the frequency bands as an indicator of the functional connectivity between two brain sites. As expected, increased, or hypercoherence was displayed for theta activity across bilateral temporal regions (T3-T4) in every child. Conversely, hypocoherence was displayed in both delta and beta bands between Cz and Fz. In support of these findings, research (by Leisman 2002), has shown a significant correlation between Dyslexia and observed lower inter-hemispheric and higher intra-hemispheric coherences. To address the abnormalities detected in this study, all subjects completed twenty 30-minute sessions of Neurofeedback. Participants were administered the reading and phonological skills tests several times throughout and following their training. After completing Neurofeedback, post-QEEG recordings indicated normalized coherence within all targeted bands. Additionally, reading and phonological skills tests helped to confirm neurological improvements lasted 3 months following training, revealing significant decreases in overall word-reading mistakes and word-reading times, as well as increases phonological awareness (Figure 2). These functional changes suggest regulation of coherence within the brain may allow for an integration of sensory and motor areas that is otherwise lacking in those with dyslexia. By modulating these pathways, Neurofeedback demonstrates it's potential to serve as an effective modality for treatment of reading disorders and other neurologically rooted condition.

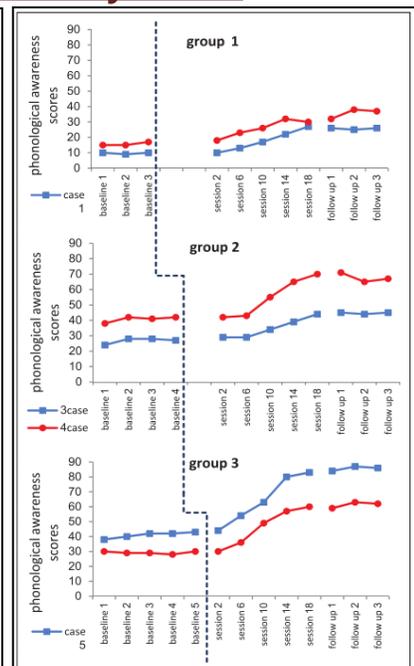


Figure 2. Phonological awareness scores across baseline, treatment, 1-week, 1-month, and 2-month follow-up assessments conducted for all 3 groups.

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

Nazari, M., Mosanezhad, E., Hashemi, T., & Jahan, A. (2012). The Effectiveness of Neurofeedback Training on EEG Coherence and Neuropsychological Functions in Children With Reading Disability. *Clinical EEG and Neuroscience*, 43(4), 315-322

Connectivity-Guided Neurofeedback for Learning Disabilities Provides Success for a Client at The Neuroconnection

With the use of Connectivity-Guided Neurofeedback (CGNFB), The Neuroconnection has had a great deal of success addressing the symptoms of a wide variety of learning disabilities. One client in particular was a 13 year old named "Kyle". Kyle began Connectivity-Guided Neurofeedback in April of 2014 with a diagnosis of Expressive Language Disorder, Dyslexia, and ADD.

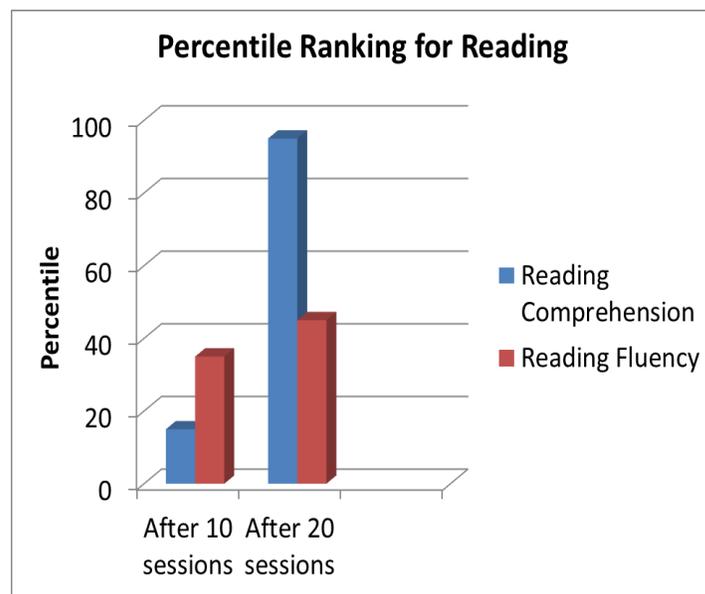
At the time of his first intake, Kyle was 2 years below grade level in the area of language arts. Specifically, he struggled with reading comprehension, vocabulary, and writing with correct grammar and punctuation. He had an IEP at school and was pulled out for language arts to participate with the provision of special education. Kyle also received extra time and modified testing procedures. In addition to the academic concerns, his parents reported that Kyle also experienced low mood, irritability, low frustration tolerance, inattention, poor eye contact and social pragmatics.

A QEEG was administered in order to determine the parameters for Kyle's CGNFB training. Kyle then participated in twice weekly CGNFB sessions. Following his first set of 10 sessions, Kyle displayed improvements with reading comprehension. His parents noted that he was not only better with comprehending what he was reading but that he also was now more interested in reading. Additionally, parents reported positive changes regarding Kyle's mood. Specifically, he was less aggressive, less irritable, and had developed empathy for others.

After the first 10 CGNFB sessions, a reading test was administered by the professionals at The Neuroconnection to get a new reading baseline. Kyle scored in the 15th percentile in the area of reading comprehension and in the 35th percentile for reading fluency. According to age-based norms, this placed Kyle in the average performance level for reading comprehension and in the below average level for reading fluency.

Kyle continued with a second set of CGNFB sessions that was determined after a re-map QEEG. By the completion of his second set of 10 sessions, Kyle gained additional improvements in reading. In order to compare Kyle's reading with the baseline that was administered prior to beginning the second set of sessions, the reading test was readministered. The findings were remarkable. Kyle scored in the 95th percentile in reading comprehension and in the 45th percentile in the area of reading fluency. As a result, Kyle now performed in the superior range in the area of comprehension and in the average range for fluency in

comparison to age-based norms. He also continued to show progress with overall mood and empathy for others. Furthermore, Kyle was able to think more clearly, he was more motivated, and had quicker reaction time.



Although Kyle was well where he needed to be in the area of reading, his parents decided to pursue a third set of CGNFB sessions after a re-map QEEG was conducted. They were hoping to see additional changes in Kyle's attention. Needless to say, by the end of Kyle's third set of 10 sessions, his parents were impressed with the outcome. Not only was Kyle more attentive and focused but he could now do his homework on his own, a task that was always a challenge for him. All of these changes positively reflected Kyle's grades which dramatically improved.

Upon administering another re-map QEEG, a final set of sessions was conducted. These 10 sessions had a significant impact on Kyle's writing. After his last session, a meeting reviewing his progress was held to update Kyle's progress. Kyle's parents were eager to share a story about his recent writing assignment. The requirement set forth by his teacher was a 6 page paper related to a given topic. His parents reported that Kyle surpassed all expectations by independently writing a detailed 10 page paper. This was a huge accomplishment for Kyle. His parents could not believe the positive turnaround that resulted from Kyle's CGNFB sessions and were eager to see his future unfold.

The Neuroconnection is pleased to share the success of Kyle's progression during CGNFB training. With the long-lasting results, we are confident that Kyle now has the necessary skills to be a successful student.

*Name and dates have been changed to maintain confidentiality.

@ Home Training through The Neuroconnection

Upon seeing such excellent results in the past 7 years with Connectivity Guided Neurofeedback (CGNFB), we wanted to find a solution to provide the training to those outside of our area or with schedule inflexibility. As a result, The Neuroconnection provides an @ Home Training program to conduct CGNFB sessions in the convenience of your home. Since 2011, we have been providing our expertise and therapeutic treatment to families all around the world. The option of training daily at home has been proven successful with our clients expanding as far as Russia and India.

The @ Home Training program first starts off with an initial intake, along with a QEEG or "brain map" in the office. A custom protocol is then made for the specific needs of the client. At this time, an extended training session is set up within the office to instruct you on how to run a session. We provide you with all the necessary tools and equipment including the neurofeedback system in addition to a laptop which is pre-loaded with all the software and protocols required to conduct training sessions at home. We also provide an Atlantis amplifier, electrodes, head cap to show correct placements, and an @ Home Training manual.

Following the training, we monitor you at home via Skype to verify that you are receiving CGNFB training correctly. Once you feel comfortable training with the software, you may then begin to run sessions on your own with The Neuroconnection monitoring your progress. One protocol consists of 20 sessions, with at least two sessions ran each week until completion of the set protocol. Once finished with the first protocol, you would then return to our office for a QEEG remap to allow for pre and post comparisons.

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 25 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 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 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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