Neurofeedback 101: A Crash Course for Professionals

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Welcome!
About Us

- We are **Licensed Clinical Professional Counselors**
- We are **Board Certified in Neurofeedback (BCN)**
- We have **advanced training** in the brain and neurofeedback and biofeedback
- We both use both biofeedback and neurofeedback in our practices in downtown Silver Spring
Learning Objectives

• Define and distinguish **Biofeedback** and **Neurofeedback**

• Identify **five types of brain waves** and associated states

• Recognize common information provided on a **brain map**

• Broadly understand how the brain map **informs** neurofeedback

• Explain how **brain dysregulation manifests** in different disorders and how neurofeedback interventions can help

• Recognize clients **who are appropriate referrals** for neurofeedback
Road Map

- What is Biofeedback?
- What is Neurofeedback?
- How does Neurofeedback Work?
- Q&A (10 mins)
- Case “Johnny” – 10 year old male with ADHD symptoms
- 15 minute Break ~ 10:30-10:45
- Case “Tom” – 37 year old male with Anxiety/Trauma
- Case “Ann” – 80 year old female with Insomnia/Memory Issues
- When to Refer? How to Refer?
- What is the research supporting neurofeedback?
- Summary/ Take homes / Q&A
New Paradigms

Mind

Brain

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What is Neurofeedback? (NFB)

- NFB is a method of training brainwaves to alter the function of the brain
- Improves the function, flexibility, and efficiency of the brain
- It is used to help people reduce symptoms of a variety of disorders
  - ADHD
  - Depression
  - Anxiety
  - TBI, Stroke
  - Seizures as well as others
What is Biofeedback?

• **Neurofeedback** is rooted in the principles of biofeedback

• **Biofeedback** is the process of using instrumentation to provide information to the body that a person is not typically aware of
What is Biofeedback?
What is Biofeedback?

When you become aware of your physiology ….

you can change it!

This is the essence of biofeedback.
Every day forms of bio-feedback
You have to have accurate feedback, of course!
Biofeedback

You learn to control your own body

Measurement

Audio-visual Display

Biofeedback Device

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Biofeedback

- **Heart Rate Variability** (Heart Math Institute, Inner Balance)
- **Thermal** (Handwarming)
- **Blood pressure**
- **Breathing** (e.g., Belly Biofeedback – Diaphramatic Breathing)
- **EEG** (Electroencephalogram)
Just like riding a bike…
Neurofeedback
Recap: What is Neurofeedback?

**Neurofeedback** is a system for training the brain to improve function, flexibility, and efficiency. Based on **biofeedback**, it reflects information back to the person which allows them to modify the way their brain works.
Also called:

- Neurofeedback
- EEG Biofeedback
- Brain training
- Neuro-therapy
- Neuro-training
- Attention training
- Peak performance training
How Does Neurofeedback Work?

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The signal is VERY tiny, measured in microvolts – about 1 millionth of a volt.
We can detect this electrical signal using sensors – electrodes – placed on the scalp.
These electrodes pick up information about brain waves --similar to the way stethoscopes pick up information about our hearts and lungs.
This electrical signal is then magnified by some kind of amplifier, which is then fed through a computer.
Game: Space Race
Operant Conditioning

- The individual is rewarded for his/her training efforts during NFB training
  - Auditory Feedback
  - Visual Feedback

- The reward process is called “reinforcement” (Behaviorism)
Long-lasting Learning

- Once we learn something it becomes a part of our behavior
- Follow up studies in neurofeedback show that the effects continue for up to 30 years (Soutar, 2011)
What to Expect?

- Initial consultation
- Evaluation
  - Brain Map & Symptoms Measures
- Treatment begins with a thorough assessment
- 2-3 sessions a week
- 20-30 minutes of feedback
- Session total time 45mins-1 hour
- Typically 20-50 sessions to complete treatment
When do people start to feel better?

• Each individual responds differently to NFB
• The greater their sensitivity to neurofeedback the more quickly they feel effects
• Sensitivity to drugs often predicts sensitivity to NFB
• Some individuals feel changes in 1-5 sessions for others it can be 15-20 sessions

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What’s happening in the brain?
Well-being and optimal brain functioning occur when your brain is functioning efficiently and effectively.
Optimal Functioning

- Optimal arousal
- Optimal performance
- Impaired performance because of strong anxiety
- Increasing attention and interest

Diagram showing the relationship between arousal and performance, with optimal performance occurring at a moderate level of arousal.
So…

• A healthy, well-regulated brain can shift easily between arousal states to meet everyday demands
Brain dysregulation:
• when the brain “gets stuck” and operates from one of three states of arousal level

UNDER AROUSED
Inattentive, Disorganized, Easily Distracted, Daydreamy

MIXED
Inattentive, Anxious, Angry

OVER AROUSED
Stressed, Hyperactive, Impulsive, Sleep Issues
Brainwaves

- **Delta**: 1-4 Hz
  - Sleepy
- **Theta**: 5-8 Hz
  - Relaxed Inward Focus
- **Alpha**: 9-12 Hz
  - Thinking
- **Beta**: 13-19 Hz
  - Tension, Anxiety
- **High Beta**: 20-39 Hz

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UNDER AROUSED

TOO MUCH SLOW BRAIN WAVES (THETA & ALPHA)

OVER AROUSED

TOO MUCH FAST BRAIN WAVES (HIGH BETA)

MIXED

TOO MUCH FAST & SLOW BRAIN WAVES
Snapshot of data at site cz

Normative

ADHD

OCD / Anxiety Disorders

PTSD
QEEG comparison
Questions?
Case 1: Jonny
10 year old ADHD
The drawings above are from a 10-year-old child who had been diagnosed with ADHD. She drew the first one prior to neurofeedback and the last one after three months of neurofeedback treatment. Picture courtesy of Dr. Bessel van der Kolk, Medical Director of the Trauma Center in Boston, MA.
BREAK for the BRAIN
3 Tenants

1. Brain produces electrical activity that can be measured
2. This electrical activity correlates with mental states
3. This activity can be trained through learning (operant and classical conditioning)
Case 2: “Tom”
36 year old
Trauma/Anxiety
Case 3: “Ann”
80 year old
Insomnia/Memory Issues
Appropriate Referrals for NFB

- Mood disorders
- Anxiety
- ADHD and issues with focus, attention, and executive functioning
- Insomnia and sleep issues
- ASD, Asperger’s Syndrome, Sensory Processing Issues
- Stress-related physical issues, like migraines, IBS, and headaches
- Trauma symptoms
- Post-concussive issues (after a couple of weeks)
Not Appropriate Referrals for NFB

- Currently taking benzodiazepines
- Changing medications (wait until stable)
- Untreated addiction (unless as part of treatment program)
- Actively suicidal (not suicidal ideation)
- Active eating disorders
- Really negative situations (negative relationship/abuse/bullying) – progress in NFB may be slower unless these are addressed
- Systemic issues: need to figure out these underlying issues first
  - Metabolic issues, Hormonal, Infection, Nutrition
Appropriate NFB Providers

- Look for board certified providers.
  - Board certification is highest standard and is given by BCIA, the international certifying board.

- Can locate BCN providers at bcia.org

- Important for clients to find a clinician with convenient location and scheduling to accommodate multiple appointments a week

- Clinician with experience with population and issues

- Clinical license
Research & Resources
Over 40 years of research shows that neurofeedback can be helpful with a number of different psychological and neurological conditions.

<table>
<thead>
<tr>
<th>ADHD</th>
<th>Anxiety</th>
<th>Panic Attacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insomnia</td>
<td>Chronic Pain</td>
<td>Bedwetting</td>
</tr>
<tr>
<td>Migraine</td>
<td>Fibromyalgia</td>
<td>TBI</td>
</tr>
<tr>
<td>Tension Headache</td>
<td>PTSD</td>
<td>Depression</td>
</tr>
<tr>
<td>Learning Disorders</td>
<td>Autism / Asperger’s</td>
<td>Tics</td>
</tr>
</tbody>
</table>

As well as other conditions
Strength of Evidence Definitions

**Level 1: Best Support**

I. At least 2 randomized trials demonstrating efficacy in one or more of the following ways:
   a. Superior to pill placebo, psychological placebo, or another treatment.
   b. Equivalent to all other groups representing at least one Level 1 or Level 2 treatment in a study with adequate statistical power (30 participants per group on average) and that showed significant pre-post change in the index group as well as the group(s) being tied. Ties of treatments that have previously qualified only through ties are ineligible.
   II. Experiments must be conducted with treatment manuals.
   III. Effects must have been demonstrated by at least 2 different investigator teams.
## Evidence Base for NF for ADHD

<table>
<thead>
<tr>
<th>Year</th>
<th>Journal</th>
<th>Sample</th>
<th>Control</th>
<th>Random</th>
<th>Key Results/Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>*Journal of Child Psychology and Psychiatry</td>
<td>102</td>
<td>✓</td>
<td>✓</td>
<td>Results indicate <strong>clinical efficacy of NF</strong> for children with ADHD.</td>
</tr>
<tr>
<td>2006</td>
<td>*Neuroscience Letters</td>
<td>20</td>
<td>✓</td>
<td>✓</td>
<td>Results suggest <strong>NF has the capacity to functionally normalize brain systems mediating selective attention and response inhibition</strong> in ADHD children.</td>
</tr>
<tr>
<td>2006</td>
<td>*Applied Psychophysiology and Biofeedback</td>
<td>20</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Clinical EEG and Neuroscience</td>
<td>1,194</td>
<td>N/A</td>
<td>N/A</td>
<td>Meta study concluded <strong>NF is efficacious &amp; specific</strong> for ADHD.</td>
</tr>
<tr>
<td>2012</td>
<td>BMC Psychiatry</td>
<td>130</td>
<td>✓</td>
<td>✓</td>
<td><strong>NF is as effective as methylphenidate.</strong></td>
</tr>
<tr>
<td>2002</td>
<td>Applied Psychophysiology and Biofeedback</td>
<td>100</td>
<td>✓</td>
<td></td>
<td><strong>NF showed significant improvement in behavior,</strong> Ritalin did not. <strong>NF group showed normalisation</strong> of EEG, Ritalin group did not.</td>
</tr>
<tr>
<td>2005</td>
<td>Child and Adolescent Psychiatric Clinics of North America</td>
<td>100</td>
<td>✓</td>
<td></td>
<td><strong>NF group still showed improvement 2 years after end of NF,</strong> Ritalin effect ended on cessation of medication. <strong>80% of NF group reduced Ritalin by &gt; 50%;</strong> 85% of Ritalin group increased dose, 0 reduced.</td>
</tr>
<tr>
<td>2007</td>
<td>Applied Psychophysiology and Biofeedback</td>
<td>38</td>
<td>✓</td>
<td>✓</td>
<td>2 different NF protocols showed improvement in all 4 measures.</td>
</tr>
<tr>
<td>2008</td>
<td>International Journal of Bioelectromagnetism</td>
<td>38</td>
<td>✓</td>
<td>✓</td>
<td><strong>Improvements still present from NF 2 years after original trial.</strong></td>
</tr>
</tbody>
</table>
Recent Developments

✓ Neurofeedback is considered an evidence-based practice by the American Psychological Association

✓ American Academy of Pediatrics recognized neurofeedback as a Level-1: Best Support Intervention for ADHD in 2012

✓ Substance Abuse Mental Health Services Administration (SAMHSA) added a neurofeedback protocol to National Registry of Evidence-Based Program and Practices (NREPP)
www.isnr.org: International Society for Neurofeedback and Research. This site contains a comprehensive bibliography of outcome research in neurofeedback, organized by disorder, as well as journal articles, provider list and other information.

www.bcia.org: National credentialing organization for biofeedback providers. Includes information on providers and standards.

www.aapb.org: Association for Applied Psychophysiology and Biofeedback is the national biofeedback organization. Includes information and a provider list.
Resources – Books

- **A Symphony in the Brain** by Jim Robbins
- **Getting Rid of Ritalin** by Robert W. Hill, Ph.D and Eduardo Castro, M.D
- **ADD: the 20 Hour Solution** by Mark Steinberg, Ph.D. and Siegfried Othmer, Ph.D.
- **The Healing Power of Neurofeedback** by Steven Larsen, Ph.D.
Resources: Books

- **Neurofeedback in the Treatment of Developmental Trauma** by Sebern Fisher
- **The Body Keeps the Score** by Bessel Van Der Kolk
“Neurofeedback should play a major therapeutic role in many difficult areas. In my opinion, if any medication had demonstrated such a wide spectrum of efficacy it would be universally accepted and widely used”

Dr. Frank H. Duffy,
Professor and Pediatric Neurologist at Harvard Medical School
Questions?
Thank you! Contact Us!

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