Functional Neurology Bootcamp Lesson Outline

Lecture Summary Key Points:

1. **Presentation Title:** Functional Neurology Bootcamp (Your First Step To Learning Functional Neurology & Mastering Nervous System Optimization
2. **Topic Relevance:** This topic is relevant to any practitioner wanting to learn how to leverage Functional Neurology for the purpose of Nervous System Optimization and for solving the chronic pain puzzle.
3. **Takeaway Message:** Being good at Nervous System Optimization requires clinicians to understand how their treatments affect the brain. These effects may, at times, be suboptimal, thus significantly interfering with the optimization process. Understanding this and recognizing when suboptimization is occurring will allow clinicians to maximize the positive effects of their treatments.
4. **What You Will Learn**
    a. How to apply the fundamental concepts in Functional Neurology to Nervous System Optimization.
    b. How understanding Neuron Theory changes your treatment approach.
    c. How Transneuronal Degeneration & Diaschisis influence Nervous System Optimization
    d. How to apply the 3 foundational pillars of Nervous System Optimization.
    e. What it means to take a "Brain-Based Approach" and how to target specific brain areas. Without A Target, It's Difficult To Aim.
    f. How to use the chief complaint to localize areas of brain dysfunction.
    g. The Good & Bad of Neuronal Plasticity
    h. Clinical Applications- How to leverage the five domains of Nervous System Optimization
5. **Presentation Format:** Dynamic interactive style, including lectures and multiple hands-on practicums designed to reinforce the presented concepts.

Lecture Outline:

1. **Introductory Points**:
    1. **What is Functional Neurology**?
        1. Functional neurology offers a conceptualized understanding of the nervous system as an integrated network that controls the body's homeostasis through balanced neuronal firing.
        1. It is founded on the principle of neuroplasticity, in that nerve connections in the brain may be modified or shaped by various afferents, including sensory, cognitive, emotional, or motor experiences, thus amenable to rehabilitation.

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1. Functional neurology represents a paradigm of healthcare that utilizes an evidence-based approach to quantify brain function.
1. It does not represent a theory, hypothesis, diagnostic, or treatment application.

1. What is Functional Neurology Used For
    1. Disease to performance spectrum
    1. An application can be used anywhere along the spectrum, though the same application can be used with different individuals.
    1. The skill is to know when to use which application.
2. What Can Functional Neurology be used for:
    1. Can be used to affect any disease or condition that involves the nervous system. This weekend, we will focus on
        - **Nervous System Optimization**
            1. Addressing levels of neurological decompensation
            2. Give an example of an athlete who chronically sprains their right ankle and has had it treated by one expert over the other.
    2. **Addressing Neuro biomechanics and Pain Modulation**
        - Give an example of a person with chronic Migraines that is not responding to conventional treatment to the neck.

2. Discuss What the Value Proposition is in Taking This Course.

1. This course will teach you two things.
    1. Foundations of Nervous System Optimization by looking at optimizing:
        - Fuel Delivery
        - Activation
        - Oxygenation
    1. Foundations of Solving Chronic Pain Using Functional Neurology by:
        - Optimizing activation of descending pain inhibitory centers
        - Reducing the activation of pain-inducing mechanisms
            1. Peripheral Sensory Nerves
            2. Central Mediated Neuro Matrix Pathways

3. Why Target the Brain

1. The brain represents the central governing system of the body.
1. By affecting this system, you can affect the entire body.
1. What targets could a practitioner use, as these targets differ with various approaches? (7 Longitudinal Levels of The Lesion)
    1. End Organ
    2. Peripheral Nerve
    3. Spinal Cord

4. Cerebellum
5. Brainstem
6. Thalamus
7. Cortex

1. Just because the approach to the target may differ does not make that approach any better or worse than another.
1. Functional Neurology allows you to choose the best target to approach and the best approach to that target.

4. Discuss what it means to take a brain-based approach.

1. Start With a Patient Example
    1. A patient has Neck Pain
    1. Each practitioner will theorize a different target as a nidus to the problem and treat it to reduce pain.
    2. They will assume that what they treated in the periphery was the nidus, which yielded an improved outcome. However, another practitioner may take a different approach. Treat another region and achieve positive results while assuming that what they treated was the causative nidus.
        - Chiropractor: Subluxation
        - PT: Intersegmental Joint Dysfunction and muscle asymmetry.
        - Acupuncture: Chi Imbalance
        - Nucha Practitioner: Atlas Subluxation
        - But all of these are governed by the nervous system, which is governed by the brain.
        - Thus, the only way all these approaches could work is if they all affected Brain Function simultaneously; the change in brain activity was responsible for the patient's symptoms in the first place.
    1. Using Functional Neuro is not replacing your technique but fortifying it and allowing you to make better decisions to help your patient.
1. Bring in what all the causes could be.
    1. Subluxation muscle tension
    1. Eye problem
    1. Vestibular Imbalance
    1. Basal Ganglia produces dystonia.
1. We must look at the vestibular system for an answer and how it attempts to fix imbalances.
1. Looking at UVL, the muscular reaction substitutes for the loss by increasing muscle tone in the plane of the asymmetry. Thus, subluxation can sometimes be viewed as a way for the brain to try to fix its asymmetry.

1. Subluxations/fixations can, in one way, be viewed as segmental dystonia that is secondary to brain dysfunction.
1. Taking a brain-based approach suggests that some subluxations exist to reduce brain asymmetry and thus should not be addressed while others do. Understanding that and differentiating the two is invaluable in treating chronic conditions.
1. Some clinicians would say that all manual therapies affect the brain, so they assume they are taking a brain-based approach. The difference between that statement and functional neurology lies in **Target Specificity, Target Outcome,** and what you are trying to accomplish. Without a target, it isn't easy to aim.
    1. Are you trying to upregulate the target or downregulate it?
    1. Are you trying to create positive or negative plasticity?

5. Discuss Target Localization by Chief Complaint.

1. This is a process where certain known brain lesions present with specific chief complaints.
1. Knowing this material makes you more efficient and specific.
1. It cuts down on the guessing game and examines to see what shows up.
1. Taught In-depth within the CNS program and introduced in FNE & Pain Reset
1. DDX to the pathophysiology of the condition to physical and neurological exam to TX**.**
1. One should not skip any aspect of that order. You cannot start the race at the finish line.
2. Examples:
    1. Falling Backwards: Basal Ganglia
    2. Falling To the Side: Ipsilateral Cerebellum/Contralateral Hemisphere
    3. Feeling Pushed to One Side: Ipsilateral Vestibular Loss
    4. Ataxia With Leg Stiffness: Spinal Cerebellar Degeneration

6. Discuss the consequences of not understanding and utilizing a brain-based approach to patient care.

1. Let me ask: Is it possible to do something with a seemingly positive short-term result but an adverse long-term outcome?
1. Can it hurt brain function?
1. Can we promote aberrant biomechanics and maintain chronic subluxations?
1. Can we adjust someone and have an adverse reaction?
    1. Pain
        - Decreasing the firing of peripheral c fibers but at the same time decreasing the activity of descending inhibition.
            1. Show a diagram of this.
    1. Headaches
        - Reducing the activity of the spinal trigeminal nucleus but simultaneously reducing inhibition or creating a more significant vestibular imbalance.

1. Dizziness
    - Creating more vestibular imbalance

7. **Discuss Neuron Theory:**
    1. Neuron theory describes the foundational constructs of how the individual units of the nervous system, called neurons, work, and communicate with one another.
    1. Within the theory, three foundational requirements exist for a neuron to maintain optimum health:
        1. Appropriate Fuel Delivery (In the form of nutrients)
        1. Appropriate Oxygenation
        1. Appropriate Activation
    2. Assess Rib Movement and eye-tracking movements or test the deltoid muscle under full inspiration and expiration. Perhaps also use arm swing and dual tasking before and after rib adjustment
        1. Adjust the reduced rib side and recheck.
        2. Breathing Exercises
        3. Thoracic Mobilization
        4. Foam Rolling
8. **Why Is Understanding a Neuron's Central Integrative State Important?**
    1. The central integrative state of a neuron can be defined as the state of a neuron's electrical condition at any one point in time based on the summation of all its excitatory and inhibitory presynaptic integers.
    1. Many forms exist; however, the most common forms are those described by high and low states.
    1. **High Central Integrative State.**
        1. Describes a condition where the neurons receive high presynaptic integration. This results in a relatively stable electrical state with good neuron viability and firing.
        1. It is the preferred state in an optimized nervous system.
    1. **Low Central Integrative State:**
        1. Describes a condition where the neurons receive low presynaptic integration. This results in a relatively unstable electrical state with poor neuron viability and firing.
        1. It is the non-preferred state in an optimized nervous system.
9. **Discuss how one would measure the Central Integrative State of a targeted Pool of Neurons in the Brain:**
    1. Ease to summation
    1. Fatigue of activation
    1. Fatigue of repetitive stimulation
    1. Diminished brain reserve capacity.
    1. **Practicum:**
        1. Using PLR responses

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10. **Discuss how a neuron reacts to a decrease in any afferent input by discussing Transneuronal Degeneration and Diaschisis.**
    1. **Acute**
        1. The first is the loss of ATP Production
        1. The second is the loss of Na/K Pump activity.
        1. The third is a rise of the resting membrane potential closer to the neuron's depolarizing threshold.
    1. **Chronic**
        1. Loss of Immediate Early Gene Responses
        1. Decreased Protein Production
        1. Long-term adverse structural changes are often referred to Trans Neuronal Degeneration or Retrograde Chromatolysis.
    1. Give an example.
11. **Discuss Transneuronal Degeneration and Diaschisis:**
    1. **Need to hit the right target (Specificity Matters)**
        1. For Example, you may do something to the left arm to affect the parietal lobe, but that may not be specific enough to create a change.
        2. You will measure that by analyzing pre- and post-motor functions associated with parietal integration.
    1. The main point of this section is to bring up the idea that environmental stimulation plays a significant role in brain development and maintenance both in utero and through adult life.
    1. Connectivity Process
        1. Before a newly developing neuron begins its migration, it must be connected to a previously developed group of neurons.
        1. This process ensures ongoing connectivity of all parts of the nervous system.
        2. The take-home point is that the most significant influence on central integration comes from two areas.
            - Spine
            - Vestibular System
    2. **Timeline of Development.** Vestibular-Somatosensory-Hearing-Vision etc.
2. **Define Plasticity & What It Matters.**
    1. **Give examples of both positive and negative plasticity**
        1. **NEG**
            - Bad Ergonomics leading to neurological and biomechanical asymmetries.
            - Pain leading to biomechanical compensations or the biomechanical compensations leading to pain.
        2. **POS**

- Nervous system optimization
- Learning a language
- **Learning a New/Different Movement:**
    1. Just like learning a vocal language, movement is a language.
    2. Start simple, then more complex, then it's learned, and you don't think about moving a certain way.

12. Discuss The Five Domains of Nervous System Optimization (NSO): (Define each domain and tie it into NSO and pain modulation. Develop an example/practicum for each.

1. **Visual System**
    1. **Volitional Eye Movements (Efferent)**
        - Gaze Holding
            1. Changes tone and favors that change in the direction of eye positioning.
                1. Example. Turning right and left while looking in the direction and opposite the direction of head rotation.
                    1. Increased ROM, usually in the direction of gaze
                    2. Looking to the right (Pulse Step)
                        1. Left cortex, left Midbrain, right pons 2:1 favoring left cortex.
                    3. For example, for a patient with a left hemisphericity, you will have them look to the right when you adjust them.
    1. **Reflexogenic Eye Movements** (Discussed in FNE & Pain Reset)
        - Optokinetic Responses
            1. Do the same as in gaze by checking cervical ROM and running OPK Right and left.
    1. **Afferent Light stimulation**
        - Eyelights: Use muscle Testing Example.
        - Go over Peter's analysis method to decide the stimulation type.
1. **Vestibular System**
    1. **Peripheral Afferent**
        - Basic Anatomy and Physiology – Push Pul uVL posture compensation
        - Angular Rotational Movements (Labyrinth)

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- Translational Movements (Otoliths)
    1. Use the Gonstead Example as a chiropractic as to why the technique was more successful.

1. Central Integrative

- Will focus on the peripheral but understand that most people miss the central due to its complexity.
- What is centrally maintained vestibulopathy?
    1. Visual
    1. Vestibular
    1. Proprioceptive
- Neurons are not healthy enough to maintain our central frames of reference and to calculate change against them.

2. Examples/Assessments

- Romberg's:
    1. Classically, a test for structural cerebellar Pathology
    2. I.e., someone closes their eyes and falls over to the left.
    3. We are going to look at things in a much more subtle manner by looking at the direction of sway, not just the falling.
    4. People will sway toward the side of uVL and vestibular nuclear (Cerebellar) deficits.
        1. We will teach you the broad categorization right now but understand some subcategories require different approaches.
        2. BEST Test
            1. Teach the screen as they do not know, even if their patients have a vestibular issue.
            2. This will produce the need for them to learn more.
            3. Advanced clinicians may bypass the test because they can pick out patients with vestibular lesions using other things.
- Applications:
- Rotational Therapy: Rhomberg's Sway and have people turn to the side and opposite side of sway.

1. Somatosensory System

1. Define what is involved.
2. Anatomy Physiology

- Joints
- Tendons
- Muscles
- Ligaments
- Skin

3. Test: Accuracy of Touch Localization
    - Pre/Post stretch VS Isometric vs. Vibration
4. Use the right tool for the right patient.
5. Vectors matter using taping.
    - Develop practicum.

1. Cognitive System

1. Neuroanatomy and physiology
2. Define what it is.
1. Intellect and emotionality
1. Arm Swing with and without cognitive loading
    - There is only so much fuel to go around.
    - If you see a decrease in arm swing, the reserve is low.
    - So, if they fail, you probably don't want to give them all this active therapy first.
    - Active Vs. Passive Therapy
    - Checks for functional reserve capacity.
    - **Practicum:**
        1. Stroop with arm swing and dual tasking using active vs. passive figure eights.

1. Autonomic Nervous System

1. Anatomy Physiology, what it is, why it matters.
2. Fuel Delivery
3. Compass 31 Handout
1. Pulse Oximetry (O2 Perfusion) Input
    - Window into sympathetic/parasympathetic tone
    - Decreased perfusion = increased SNS tone
    - Important: Every stimulus has an initial sympathetic response
        1. Adjustment can decrease perfusion.

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        2. Adjustment light brighter. Blurred vision: was it good or bad?
    1. Red desaturation (1st Rib) (Output)
    2. Pulse Rate, Supine seated standing
        - What is it?
        - Norms
        - Value Identification
        - Future modules focus on fixing the brain contributing to these.
2. Tie Autonomics to Pain and Performance
    1. Pain: sympathetic mediated
    2. NSO: Fuel delivery
3. Case Presentations:
    1. Nervous System Optimization:
        1. Migraine Patient
    2. Pain
        1. Chronic Knee Pain

Demonstrations

In this area, showing them that we can improve things by looking at and testing different brain activation patterns may be beneficial. For instance, using eye muscle facilitation in testing balance. How will knowing that the person is unstable in a down and right eye position but more stable in an up and right eye position change your treatment?

1. Muscle testing with different eye positions.
2. Eye Muscle Testing using Eyelights and or hemifield glasses.
3. Psoas Muscle Testing using:
    1. Lateral Eye Movements
    1. Eyelights
    1. Hemifield glasses
4. Fakuda Step Test
5. Muscle testing with different head positions
6. Touch localization and pain perception
7. Eye Lights Muscle Testing
8. The Ober test is always a good one to use.
    1. Works well with lateral eye movements.
    1. Eye lights
    1. Hemifield glasses
9. Looking at Erector Spinae muscle tone imbalance and primitive reflexes
    1. Is ipsilateral PDW.
    1. Contralateral Frontal Release Sign
10. Pyramidal Weakness

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11. Head Eye Neck Pursuit Testing
12. Functional Short Leg analysis
    1. Eye Positions
    1. Head Positions
13. Kemps Test
    1. Eye Positions
    1. Head Positions
14. Cervical Compression Testing
15. Joint Positions Error Testing
16. Red Desaturation Testing
    1. 1st rib dysfunction ipsilateral
    1. Press on anterior scalenes to see if it makes it worse.
    1. Crease adjusting strategies and use Red Desaturation to decide the best approach.

We need to establish why we are muscle testing at all. And really, it is all about looking for an output, and the motor system gives us that. In reality, we need something visual to glimpse into nervous system function.

Added thought for getting more straight chiros or subluxation-based chiros interested in functional neurology.

Chiropractors inherently default to the concept that they are improving the innate function of the nervous system through the removal of structural interferences described primarily as spinal subluxations. The contention is that innate is perfect, and due to the structural defects, it cannot express itself appropriately, leading to an increased probability of disease. Hence, the general trend in chiropractic is to ignore symptoms and focus on improving structural integrity by eliminating subluxations.

Though this is not an entirely errant thought at its core, it is misleading as it points out that spinal subluxations are the only structural interference to innate expression. This is a microscopic view as it reduces human expression to a singularity, most likely the furthest from the truth. Nervous system structural integrity can be measured in multiple ways, from the state of a neuron's membrane to the composition of glial supportive cells. To assume that improving the structure of one system will automatically translate to an improvement in the structural integrity of another is, at best, conjecture.

So, where does this leave us? In my opinion, it leaves us with the idea that structural nervous system interference can occur in many different ways other than from spinal subluxations. If that is the case, it would be imperative for practitioners treating nervous system structural interferences to be aware of those outside of the subluxation world.

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Functional neurology is a paradigm that looks at various forms of nervous system structural and functional interferences to the expression of innate. It aims to better our target specificity and methodological approaches to optimize nervous system integration and innate expression by removing structural interference.