

Creating Neurofeedback Training Protocols & Patient Prep

Creating a One Channel ~ Monopolar or Bipolar Protocol

- 1) Open BrainMaster
- 2) Click on **Folder Selections**
- 3) Click on desired **Folder**
- 4) Click on **OK**
- 5) Click on **View or Change Settings**
- 6) Click on **Data Channels**
- 7) Click on **One** under **EEG Channels**
- 8) The following are standard settings:
 - a) **Sum Channel** = off
 - b) **4-channel Sum Method** = Combine (otherwise it is a way to control bipolar training)
 - c) **Save EEG to Disk** = Off
 - d) **Software Digital Filter Order** = 6 (6 is the mean, with Eyes Open NFB you can use a faster filter, and with Eyes Closed you can use a slower filter.)
 - e) **Amplitude Scale** = Peak to peak (RMS is for power)
 - f) **Artifact Threshold** = 240uv (however to reduce artifact you can set it between (100-120), i.e., with kids set to 120uv but not below 120uv which eliminates blinks and other artifact from being recorded ~ if power is higher than 240uv then it shuts amplifier down. (i.e. artifact)
 - g) **Software Notch Filters** = 60Hz (50Hz for Europe)
 - h) **EEG Data Sampling Rate** = 256 sps (256sps gives cleaner and more accurate EEG)
 - i) **Com Port Select:** click on **Search This PC for Available Comports:** a window will appear that gives you one or more options. In most cases you can select the last comport that is identified, i.e., if the window gives you one option only click on **YES**, if it says **Found Com port: COM3, COM 4** you would close the window and type **4** in the **Com Port Select** box.
- 9) Click on **Electrodes and Trainee Info**
- 10) For a *One Channel NFB protocol* click on the **Active 1** arrow, scroll down and click on the electrode placement area according to The 10/20 International Chart.
- 11) Click on the **Reference 1** arrow, scroll down and click on the electrode placement area according to the 10/20 International Chart.
- 12) Click on the **Ground** arrow scroll down and click on **A1** or **A2** (I always use **A2**)
- 13) If you are using a one channel monopolar protocol **Reference 1** would be **A1**
- 14) **Age** is not needed unless you are using Z-Score Training.
- 15) Click on either **Eyes Open** or **Eyes Closed** depending on the NFB training protocol you are going to use.

- 16) Click on **OK**
 - 17) Click on **OK**
 - 18) Click on **Frequency Bands**
 - 19) These are the standard settings and do not need to be changed. If you are using a standard NFB protocol (i.e., one generated by the New Mind Apps brain mapping web site, for example *2-7hz down 30%, SMR up 70%, 20-30hz down 10% C4-Pz Eyes Open*, then you would go into **Frequency Bands** and change **Theta** to **2.000** and **7.000**
 - 20) Click on **OK**
- NOTE:** If you were using a one channel monopolar NFB training protocol, i.e., *9-11hz up P4 70% and 15-30hz down 20% Eyes Closed*, then you would set **Active 1** in **Electrodes and Trainee Info** to **Pz** with **Reference 1** at **A1** and **Ground** at **A2**. In **Frequency Bands** you would set **Alpha** at 9.000 and 11.000 and **HiBeta** at 15.000 and 30.000.
- 22) Click on **Training Protocol**
 - 23) Click on each Wave you want to “Enhance/Go – Inhibit/Stop – or Ignore. Given the example above; *2-7hz down 30%, SMR up 70%, 20-30hz down 10% C4-Pz Delta* would be **Ignore**; **Theta** would be **Stop**; **Alpha** would be **Ignore**, **LoBeta** (SMR) would be **Go**; **Beta** would be **Ignore**; **Hibeta** would be **Stop**; **Gamma** would be **Ignore**; and **User** would be **Ignore**.
 - 24) Click on **Autothreshold Option**.
 - 25) **Autoset “Gos” for:** would be set at **70**
 - 26) **Autoset “Stops” for:** would be set at **30**
 - 27) **Autoset HiBeta [Stop] for:** would be set at **10**
 - 28) Autothresholding is **ON**
 - 29) Threshold updating: would be set for **Autoupdate repeat: after pre-base-line + after each run**
 - 30) Click on **OK**
 - 31) **Global Sustained Reward Criterion** is default at **500**
 - 32) **Global Refractory Period** is default at **0**
 - 33) **Original Sweet Spot Feedback Settings** is default at **Off**
 - 34) **Points Counting Method** is default on **Normal [1 Counter]**
 - 35) Click on **OK**
 - 36) Click on **Display Options**
 - 37) **Viewed Panels** is your choice. Click on the displays you want to see (I usually click on Raw Waveform, Filtered Waveform, Thermometers, and Component Trend Graphs).
 - 38) **Viewed Components** is set to the waves you want to monitor. In the case of the protocol above, *2-7hz down 30%, SMR up 70%, 20-30hz down 10% C4-Pz*, you would click on **Theta**, **Lobeta**, and **HiBeta**.
 - 39) **DII Memory Mapping Mode** is default on **Standard**
 - 40) Click on **OK**

- 41) Click on **Feedback Control**
- 42) Under **Sound Type** click on the desired sounds you wish to use, i.e., **Reward Sound** or **Midi**. If you click **Midi** then under **Midi Voice**, click on the arrow and select the sound you wish to use.
- 43) **Midi Style** and **Midi Modulation** are choice and preference. Experiment to see the differences between **Sustained vs. Percussive** and **Amplitude vs. Pitch**.
- 44) Coherence or Phase Threshold [1-100] is default at 10
- 45) **Train Coherence or Phase** is default at **UP**
- 46) **Type of Coherence** is default at **Training ["similarity"]**
- 47) Click on **OK**
- 48) Click on **Session Control**
- 49) **Baseline Length** is choice. (I usually set it at 60)
- 50) **Run Length** is set in seconds. If you are running two runs at 7 minutes for each run, you would set Run Length at 420 (which is seven minutes)
- 51) **Number of Sessions** is choice. (I usually start with 40)
- 52) **Number of Runs [Trials]** is the number of run lengths you plan to use. Given the example above, if you set it at 2, then you will be running 2 - 420 second or 7 minute runs which is a total NFB session of **14 minutes**.
- 53) **Session Type**. You will check **Training** as what we have just done is establish a NFB training protocol.
- 54) **Pause Between Runs**. If you check this box the training will stop after each Run/Trial so you can check in with the patient. If you click on the training screen and press the space bar, the session continues for the next Run/Trial.
- 55) Click on **OK**
- 56) Click on **Use These Settings**

Creating a Custom File Setting

Once you have created a file for a patient, if you have altered the protocol from the standard protocol you selected in BrainMaster, you can create your own custom settings file. This is very helpful if you are selecting NFB training protocols from the *New Mind Apps (NMA)* mapping system **Protocol Analysis** from the patients map. For example, if you map a client and look at the Eyes Opened map, you might find the following under **Protocol Analysis**:

Consider training 2-7hz down 30%, 15-20hz up 70%, 20-30hz down 10% C3-Fz Eyes Open (a left hemisphere {LH} training protocol).

And,

Consider training 13-15hz up 70%, 8-12hz down 20%, 20-30hz down 10% C4-Pz Eyes Open. (a right hemisphere {RH} training protocol).

The above two protocols are examples of standard NFB training protocols produced by the NMA system. While the waves and frequencies may vary depending upon the protocol you select, the training sites, i.e. C3, Fz, (LH) and C4, Pz (RH) are pretty standard sites.

Once you have set up the protocol for 2-7hz down 30%, 15-20hz up 70%, 20-30hz down 10% C3-Fz; to save the settings into custom file you would do the following.

- 1) Click on **View or Change Settings**
- 2) Click on **Read/Write Settings File**
- 3) Click on **Create a New Settings File**
- 4) Under **Name** you type in the custom name you want, for example using the above protocol you might call it: **New Mind LH**
- 5) Click on **Use Name For File ID.**
- 6) Click on **OK**
- 7) Click on **OK**

Now if you scroll down **Setting File Name** window, you will find the settings file you just created and saved. Next time you set up a patient folder, when you create the file folder for the patient and go to select the settings, the file you created will be there for you.

- 8) Click on **OK.**

- 9) To create a folder for C4, Pz (as noted above), you would follow the same process above (steps 1-8) but the electrode sites would be C4, Pz, and when you save the settings file you would label it, **New Mind RH**

HINT: You can save and client protocol you have created. If you want to set up custom file settings in advance, when you select the folder to use, select the Test folder. Type in your settings, with the protocol electrode sites, but leave the wave band frequencies standard, i.e., Delta 1-4, Theta 4-7, alpha 8-12 LoBeta 13-15, Beta 15-20, Hibeta 20-30. After you set up the client folder and select the settings file, you can go in and customize anything you need to for that client, i.e., wave band frequencies, length of session, etc.

Creating a Two Channel ~ Bipolar Protocol

- 1) Open BrainMaster
- 2) Click on **Folder Selections**
- 3) Click on **Create a New Folder**
- 4) Type in the **Name** you want to use (i.e., John Doe)
- 5) Type in the **File ID** you want to use (the Name that will appear in your folder.
- 6) Click on **Use Name for File ID** if you want to use the same name for both
- 7) Click on **OK**
- 8) Click on **OK** again if the Name and File ID are as you want them to be
- 9) Double **Click** on the preset Settings File you want to use (i.e., Alert, Focus, Peak, Relax, etc.)
- 10) Click on **OK**
- 11) Click on **View or Change Settings**
- 12) Click on **Data Channels**
- 13) For a *two channel* monopolar (single electrode) or bipolar (two electrodes) neurofeedback (NFB) protocol working on both right and left hemisphere simultaneously; click on **Two** under **EEG Channels**.
- 14) The following are standard settings:
 - a) **Sum Channel** = off
 - b) **4-channel Sum Method** = Combine (otherwise it is a way to control bipolar training)
 - c) **Save EEG to Disk** = Off
 - d) **Software Digital Filter Order** = 6 (6 is the mean, with Eyes Open NFB you can use a faster filter, and with Eyes Closed you can use a slower filter.)
 - e) **Amplitude Scale** = Peak to peak (RMS is for power)
 - f) **Artifact Threshold** = 240uv (however to reduce artifact you can set it between (100-120), i.e., with kids set to 120uv but not below 120uv which eliminates blinks and other artifact from being recorded ~ if power is higher than 240uv then it shuts amplifier down. (i.e. artifact)
 - g) **Software Notch Filters** = 60Hz (50Hz for Europe)
 - h) **EEG Data Sampling Rate** = 256 sps (256sps gives cleaner and more accurate EEG)
 - i) **Com Port Select:** click on **Search This PC for Available Comports:** a window will appear that gives you one or more options. In most cases you can select the last comport that is identified, i.e., if the window gives you one option only click on **YES**, if it says **Found Com port: COM3, COM 4** you would close the window and type **4** in the **Com Port Select** box.
- 15) Click on **Electrodes and Trainee Info**

Since we are setting up a Two-Channel Bipolar training, we will use the two protocols used above with the one channel training and combine the two into a single protocol. The protocols we are working with are:

Consider training 2-7hz down 30%, 15-20hz up 70%, 20-30hz down 10% C3-Fz Eyes Open (a left hemisphere {LH} training protocol).

And,

Consider training 2-7 down 30%, SMR up 70%, 20-30hz down 10% C4-Pz Eyes Open. (a right hemisphere {RH} training protocol).

- 16) For a *Two Channel NFB Protocol* click on the **Active 1** arrow, scroll down and click on the electrode placement area according to The 10/20 International Chart, (in this case C3)
- 17) Click on the **Reference 1** arrow, scroll down and click on the electrode placement area according to the 10/20 International Chart, (in this case Fz)
- 18) Click on the **Ground** arrow scroll down and click on **A1** or **A2** (I always use A2)
- 19) Click on the **Reference 2** arrow, scroll down and click on the electrode placement area according to the 10/20 International Chart, (in this case Pz)
- 20) Click on the **Active 2** arrow, scroll down and click on the electrode placement area according to The 10/20 International Chart, (in this case C4)
- 21) **Age** is not needed unless you are using Z-Score Training.
- 22) Click on either **Eyes Open** or **Eyes Closed** depending on the NFB training protocol you are going to use.
- 23) Click on **OK**
- 24) Click on **OK**
- 25) Click on **Frequency Bands**
- 26) If you are using the standard NFB protocols noted above by New Mind Apps brain mapping web site, you would change **Theta** to **2.000 and 7.000**
- 27) Click on **OK**

NOTE: *When using a two channel NFB protocol the **Frequency Bands** and **Autothresholds** are the **SAME** for **BOTH Channels**.*

28) Click on **Training Protocol**

29) Under **Select Chanel to Adjust** click on **One**. Using the protocol:

Click on each Consider training 2-7hz down 30%, 15-20hz up 70%, 20-30hz down 10% C3-Fz Eyes Open (a left hemisphere {LH} training protocol).

And,

Consider training 2-7 down 30%, SMR up 70%, 20-30hz down 10% C4-Pz Eyes Open. (a right hemisphere {RH} training protocol).

you would use the following settings for Channel One: **Delta** would be **Ignore**; **Theta** would be **Stop**; **Alpha** would be **Ignore**, **LoBeta** (SMR) would be **Ignore**; **Beta** would be

GO; Hibeta would be **Stop**; **Gamma** would be **Ignore**; and **User** would be **Ignore**. This sets the training protocol for C3, Fz (or the LH).

30) Click on **Autothreshold Option**.

31) **Autoset "Gos" for:** would be set at **70**

32) **Autoset "Stops" for:** would be set at **30**

33) **Autoset HiBeta [Stop] for:** would be set at **10**

34) Autothresholding is **ON**

35) Threshold updating: would be set for **Autoupdate repeat: after pre-base-line + after each run**

36) Click on **OK**

37) Under **Select Chanel to Adjust** click on **Two**. You would use the following settings for Channel Two: **Delta** would be **Ignore**; **Theta** would be **Stop**; **Alpha** would be **Stop**, **LoBeta** (SMR) would be **GO**; **Beta** would be **Ignore**; **Hibeta** would be **Stop**; **Gamma** would be **Ignore**; and **User** would be **Ignore**. This sets the training protocol for C4, Pz (or the RH).

38) Click on **OK**

39) Click on **Display Options**

40) **Viewed Panels** is your choice. Click on the displays you want to see (I usually click on Raw Waveform, Filtered Waveform, Thermometers, and Component Trend Graphs).

41) **Viewed Components** is set to the waves you want to monitor. In the case of the two channel bipolar protocol you have just set up, you would click on **Theta, Lobeta, Beta, and HiBeta**.

42) Click on **OK**

43) Click on **Feedback Control**

44) Under **Sound Type** click on the desired sounds you wish to use, i.e., **Reward Sound** or **Midi**. If you click Midi then under **Midi Voice**, click on the arrow and select the sound you wish to use.

45) **Midi Style** and **Midi Modulation** are choice and preference. Experiment to see the differences between **Sustained vs. Percussive** and **Amplitude vs. Pitch**.

46) Click on **OK**

47) Click on **Session Control**

48) **Baseline Length** is choice. (I usually set it at 60)

49) **Run Length** is set in seconds. If you are running two runs at 7 minutes for each run, you would set Run Length at 420 (which is seven minutes)

50) **Number of Sessions** is choice. (I usually start with **40**)

51) **Number of Runs [Trials]** is the number of run lengths you plan to use. Given the example above, if you set it at **2**, then you will be running 2 - 420 second or 7 minute runs which is a total NFB session of **14 minutes**.

52) **Pause Between Runs.** If you check this box the training will stop after each Run/Trial so you can check in with the patient. If you click on the training screen and press the space bar, the session continues for the next Run/Trial.

53) **Session Type.** You will check **Training** as what we have just done is establish a NFB training protocol.

54) Click on **OK**

55) Click on **Use These Settings**

Patient Prep

Once you have established a NFB training protocol for the patient (as outlined in the sections above), below are the basic steps to take in order to prepare the patient for the NFB training session:

- 1) Open BrainMaster
- 2) Click on **Folder Selection**
- 3) Click on patient's name
- 4) Click on **OK**
- 5) Click on **View or Change Settings**
- 6) Click on **Data Channels**
- 7) Click on **Electrodes and Trainee Info**
- 8) Clean electrode placement sites with wooden Q-Tip and NuPrep
- 9) Apply small amount of **10/Twenty Electrode Paste** (*about the size of a pea*) to **Active 1** electrode and place on site as indicated using white gauze pad (or small paper towel square).
- 10) Apply small amount of **10/Twenty Electrode Paste** to **Reference 1** electrode and place on site as indicated using white gauze pad.
- 11) Clean ear lobe site for **Ground** with an **Alcohol Prep Pad** and apply small amount of **10/Twenty Electrode Paste** to each cup and clip on ear using white gauze pad.
- 12) If running a two channel bipolar montage clean sites Active 2 and Reference 2 as outlined above.
- 13) Click **OK**
- 14) Click **OK**
- 15) Click on **Use these Settings**
- 16) Have patient focus on screen (if eyes opened training)
- 17) Click on **RUN NEXT SESSION**
- 18) **Check "Sound" and adjust to patient liking**
- 19) Verify **Frequency Bands** to be monitored
- 20) Verify **Display**

- 21) Click on **GO**
- 22) Check for artifact, i.e., Anxiety & twitching and muscle tension/bracing
- 23) Click on **Window** to set the visual to patient's interest.
- 24) **Tell patient to relax, sit still, try not to blink or move; KEEP BOTH FEET ON THE FLOOR.**
- 25) *Once patient has begun neurofeedback after 60 second baseline, check with patient every two minutes and inquire as to how the patient is feeling.*
- 26) When a "pause" occurs between runs, press the **SPACE BAR**
- 27) Run entire session.