Guide to Coherence Training with the BrainMaster

This guide explains the simplest way to set up and train coherence using the BrainMaster with 1.9A or later software. The advanced features (Event Wizard, animations, DVD's) require 2.5SE or 3.0. While the BrainMaster contains a complete protocol processor that manages the enhances and inhibits for up to 8 components for each EEG channel, the coherence subsystem has been designed to operate separately, in order to keep things simple. The coherence training system is basically a form of sound feedback, and does not interact with the protocol processor. Therefore, it is set up in a different manner, and can be used along with a standard protocol, or by itself.

More advanced protocols, such as the built-in protocol "peak" also use the Event Wizard or more advanced features such as multimedia, games, and DVD. This document explains the most simple, built-in coherence training using up or downtraining, and MIDI sounds. It then explains the built-in protocols "peak" and also "Beta coherence range training" that use the Event Wizard for advanced capabilities.

The basic key to setting up for coherence training using the built-in coherence sound function is the following:

On the Display Options dialog:

- 1. Select the components for which you wish to hear sounds
- 2. (optionally) Select the coherence display

On the Feedback Control dialog:

- 1. Select coherence sounds
- 2. Select an appropriate coherence threshold
- 3. Select whether to "uptrain" or "downtrain" coherence

You will hear coherence sounds for any components that were selected. You can modify these selections from the training screen toggle buttons, if you wish to add or delete components from being heard. In order to see the choices change, it is helpful to be watching the filtered waveforms or the thermometer window, to see the components come and go as they are selected or deselected. Once this is done, you do not need to keep any windows visible, for the sounds to be heard. The coherence sounds will be heard regardless of what screens the user is viewing.

A component will play its coherence sound when its coherence goes above (if uptraining) or below (if downtraining) the coherence threshold.

Adjust the coherence threshold so that the trainee gets useful sound feedback. It is best if the trained component plays sounds more than half the time, but not all of the time. The coherence threshold can be raised at any time by typing "c" while the training screen is the active window. The letter "C" will lower the coherence threshold.

Note that the coherence window is always available whenever 2-channel training is being done, so that it can be viewed at any time, regardless of the type of training being used. Thus, even if you are doing C3 beta/C4 smr training, you can bring up the coherence screen and see the coherence values. In addition, coherence is always written to the summary file, and to the excel file. Therefore, you can monitor and look at the coherence between any pair of channels, regardless of how the EEG training is being done.

The built-in "peak" with more features included is found in the following list:

Settings File Name: (double-click to read in settings and proceed)	Use this screen to manage your Settings Fi	
[HEG Proportional Feedback] [HEG with Trend Graph and MMP and Flash and Games working] [Heg] John Demos MINI-Q Standard Settings]	~	library. You can change settings within any trainee/study folder, without using this screen.
[kotoalph] [LEN training prototype] [lobeta organ walkup] [lobeta organs and ding]	- 1	Create a New Settings File
MINI-Q John Demos Standard Settings] MINI-Q New Mind Format (Richard Soutar)] MINI-Q Q-Metrx Standard EO & EC] Miniq]	- 1	Save Settings To This File
ngam] nth15] nth25]		Settings Description: peak testing with event wizard
Peak alpha coherence with Flash Games via. Event Wizard] Peak]	_	Directory:
[peak1] [Peak2 2-sided [left beta right smr] with Flash Games via. Event Wizard] [Peak2] [piano and violin alpha training two modes with high violin] [psmr]		/brainm.20/settings/Peak alpha coherence with Flash Games via. Event Wizard
ptheta] Relax alpha training with Flash Games via. Event Wizard] Relax]		Read In Settings From This File
[S-DEC-1F] [Sharp single component squash with Flash Games via. Event Wizard] [Sharp]	~	Cancel OK

It is designed for alpha coherence uptraining, but can be modified for other bands.

One method to modify this is to change the frequency range and/or name on the existing alpha band, to suit:

Frequency Bands and Damping Factors BrainMaster 3.0.2								
Use Hz with 0.1 resolution, 0.0 minimum e.g. 0.0, 0.1, 0.2,, 63.8, 63.9, 64.0 All bands should be 1.0 Hz wide minimum for reasonable transient response								
		Low:	High:		Low:	High:		
	Delta	1.0	3.0	Beta	15.0	20.0		
	Theta	4.0	7.0	Hibeta	20.0	30.0		
	Alpha	8.0	12.0	Gamma	38.0	42.0		
	Lobeta	12.0	15.0	User	30.0	35.0		
_ On-t	he-fly Frequency Adj	just Incre	ement					
Increment (Hz) used for on-the-fly frequency band changes. Use values 0.10 - 1.00 (default = 0.50)								
Digital Filter Amplitude Smoothing and Damping Factors								
Global Smoothing Window (used to slow ampitude changes for all displays and training using digital filters). Specify # of milliseconds to smooth over. Use values 0-1000 (0=no smoothing, default = 60)								
Text Damping Factor (used to further slow value changes for text displays). Use values 0-1000 (0=no damping, default=100) 100								
	Cancel		Standard S	Settings		ок		

You can change the word "Alpha", the lower band "8.0" or the upper band "12.0" to change the protocol, and everything (Multimedia, games, etc) will still work. If you change the selection of "alpha" in the "Display Options" dialog, then you will be training a different band, and need to make corresponding changes in the Frequency Bands, as well as the Event Wizard, to match.

The protocol design "peak" also uses the Event Wizard to produce sounds. It uses the existing calculation for alpha ("C1AC" is channel 1 alpha coherence), and it uses the built-in coherence threshold ("CT"). It then tells the Event Wizard to process sounds, control the multimedia, etc.

A Event Wizard Designer for BrainMaster 3.0.9	X
Event Number: C 1	This Event Is: © Enabled © Disabled © Visibility: © Visibile © Hidden
Event Condition: IF: Use Equation: Theta Amplitude Check Equation = C1AC/CT; RULE: IS GREATER THAN:	Sustained Reward Criterion Refractory Period Condition must be met for: Time between rewards is: 0 milliseconds
Constant: Damping Factor: Use Entered Value: Delta Del	MIDI Sound Properties: Starting Note: 25 A (220.0) 1 to 88 Instrument: 92 Bowed Glass 128 choices Playing Style: Sustained Percus. or Sust.
Event Trend Graph Scale Factor: 2 Offset: 0	Modulation: Ampl. and Pitch Ampl. or Pitch Starting Loudness: Level: 100 0 to 128 Loudness Change Rate: 4 0 to 20
	Note Change Rate: 10 O to 20 Musical Scale (Mode): Chinese Musical Key: A C to B Flat Play Note or Chord: 1 Note 1 to 8 Notes
Event Summary: Summary for Event 2: IF: EQN: x=CTAC/CT; IS GREATER THAN Value: 1.0 THEN: Play MIDI Sound MODE: 2 NOTE: 25 INSTR: 92 Bowed Glass STYLE: Sustained MODULATION: Ampl. and Pitch LOUDNESS: Level: 100 LOUDNESS CHANGE RATE: 4 PITCH CHANGE RATE: 10 KEY: A MODE: Chinese CHORD: 1 Note	Enable All Events Disable All Events Data Dictionary Clear All Events Show All Events Print All Events Help Copy Event Paste Event Cancel Use Now OK

You could add points counting to event 5 by adding the event result in the pulldown in the Event Result control area. This example also uses a refractory period of 1000 milliseconds, so 1 point per second is the maximum rate of reward:

Levent Wizard Designer for BrainMaster 3.0.9	×
Event Number: C 1 C 2 C 3 C 4 C 5 C 6 C 7 C 8 C 9 C 10 C 11 C 12 C 13 C 14 C 15 C 16	This Event Is: © Enabled © Disabled © Visibility: © Visible © Hidden
Event Condition: IF: Use Equation: Lobeta Amplitude Damping Factor: 0	Sustained Reward Criterion Refractory Period
Check Equation x=E2F; RULE: IS GREATER THAN:	Condition must be met for: Time between rewards is: 0 milliseconds
Use Entered Value: V Lobeta V 1.0	MIDI Sound Properties: Starting Note: 44 E (659.2) 1 to 88
Check Equation x=0; Note: You must press "Check Equation" to check and save any changes made to equations	Instrument: 17 Organ 2 128 choices Playing Style: Sustained Percus. or Sust. Modulation: Amplitude Ampl. or Pitch
Event Trend Graph Scale Factor: 2 Offset: -1	Starting Loudness: Level: 0 0 to 128 Loudness Change Rate: 0 0 to 20
Event Result:	Note Change Rate: 0 O to 20 Musical Scale (Mode): Chromatic 15 choices
Obey Inhibits ("stops") Control MMP Player	Musical Key: A C to B Flat Play Note or Chord: 1 Note 1 to 8 Notes
Event Summary: Summary for Event 5: EVENT 5 IS CURRENTLY: ENABLED IF: EQN: x=E2F; IS GREATER THAN Value: 1.0	Enable All Events Disable All Events Data Dictionary
THEN: Award Point (Counter 1)	Clear All Events Show All Events Print All Events Help Copy Event Paste Event
	Cancel Use Now OK

This is the display as it is first shown in the "peak" protocol, if you switch to simulation. Note that we added points counting, so points now show up, at a maximum rate of 1 per second:

Training/Control Screen -	BrainMaster 3.0.9						
<u>D</u> ata D <u>i</u> splay <u>F</u> req.Bands <u>C</u> olor	<u>S</u> ound						
GO STOP Window	Clock: 19:46 P	oints: 008	Close				
System is Idling	Checl	c Signal					
EEG CHANNEL 1: 01: Avg	g Ampl. = 31.0 u¥ Base: 0.0	00000					
m M M M M M M M M M M M M M M M M M M M							
EEG CHANNEL 2: 02: Av	g Ampl. = 39.8 uV Base: 0.1	000000					
White Marker and Marker and Marker and A							
	10						
SIMILARITY:			PHASE:				
u: 0			u: 55				
g: 0			g: 45				
h: 16			h: 49				
b: 10	+		b: 43				
1: 4			l: 55				
a: 14			a: 47				
t: 7			t: 46				
d: 2			d: 51				
			~				

The display can of course be modified by adding panels, windows, etc. to view. You can also bring up the animation, DVD player, or the Flash Games (BrainCell, BrainMan, etc.) with coherence training.

There is also a built-in beta coherence range training protocol that uses the Event Wizard for the training. It trains coherence into a range, not just up or down:

Settings File Name: (double-click to read in settings and proceed)		Use this screen to manage your Settings Fil
[Deep2]	~	library. You can change settings within any
[Deepcomp]	_	trainee/study folder, without using this
[Demo Alpha amplitude with dynamic thresholding]		screen.
[Demo alpha asymmetry with rising flute tone]		
[Demo alpha aymmetry with rising flute tone]		
[Demo alpha downtraining with multiple thresholds organ and piano]		Create a New Settings File
Demo alpha french horn walkaround using percent energy		ciota a rich coungo rico
[Demo Alpha Peak Frequency Training]		
[Demo alpha percent energy with chinese koto sounds]	_	
Demo alpha percent energy with multiple threshold viola, atmosphere, and bell sound	is]	One of the set To This File
[Demo alpha percent energy with soft whoosh sound]	-	Save Settings To This File
[Demo alpha piano and violin together]		
[Demo alpha piano in my life beatles]		Settings Description:
[Demo alpha piano walkup with bell and voice]		
Demo alpha variability downtraining with dynamic threshold]		Demo Coherence Range Training with vario
[Demo alpha variability downtraining]		sounds
Demo Beta Coherence Range Training with changing sounds]		Directory:
[Demo Further example of multiple thresholding in progress]		
[Demo Phase Change Training]		/brainm.20/settings/Demo Beta Coherence
[Demo theta beta ratio training]		Range Training with changing sounds
[Demo Wideband Inhibit with Flash Boxes]		
[Demo Wideband Inhibit with Macromedia Flash Games]		
[Demo wideband squash with loudness modulated]		
[EEG Pro 1 Channel Alpha-Theta]		Read In Settings From This File
[EEG Pro 1 Channel High & Low Inhibits]		
[EEG Pro 1 Channel Multiple Inhibits]		
[EEG Pro 2 Channel Alpha Synchrony]		
[EEG Pro 2 Channel Alpha-Theta]	~	Cancel OK

It produces the following screen:

Training/Control Screen - Data Display Freq.Bands Color		.9					
GO STOP Window		9:33 Poi	nts: (20	Close		-
System is Idling		Check S	ignal				
Component Delta Theta Alpha Lobeta Beta Hibeta Gamma User	Bandwidth [1.0-3.0]: [4.0-7.0]: [12.0-15.0]: [15.0-20.0]: [20.0-30.0]: [38.0-42.0]: [30.0-35.0]:	Grand Avg 3.6 3.4 5.0 5.1 5.1 5.1 6.9 6.1 8.7 8.4 2.5 2.1 4.4 4.	4 3.1 5 4.2 5 5.2 7 5.1 8 6.1 4 7.9 5 1.9	ped Avg. 3.1 4.4 5.1 4.7 5.6 7.4 2.1 4.3	% Energy 10.1 9.2 9.8 8.9 16.1 18.5 12.4 10.0 16.9 15.0 19.2 17.1 0.0 0.0 1.9 5.3	20.0 -	
VALUE A CHAN 1 Beta Coherence CHAN 1 Beta Coherence CHAN 1 Beta Coherence x=E2F-E3F; x=E5F;	RULE V LT 8 GT 8 GT 1 GT 1).0 ta).0 ta 3.0 in .5 n	HEN: ne h. othing oint->1	VAL A 8.29 8.29 8.29 1.00 1.00	8.00 6.5 8.00 40.0 13.00 6.5 0.50 33.3	10.0 - WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	
						Events 1-3:	

It can also be used with additional panels, games, Flash Games, Animations, and DVD's. You can also change the Event Wizard settings as desired.