Guidelines for doing real-time Z-Score training using the Applied Neuroscience Z DLL

First install the latest BrainMaster BMT (Basic Modules for Training) software, version 2.5SE April 1, 2006 or later. For the latest features, then install the 3.0.3 software.

You may set up a new folder for a trainee, or you may use an existing trainee folder. There is a built-in settings file "Z Score Training I using Applied Neurosciences DLL" that you can use to start with.

When creating a new folder, choose the settings shown below:

New Folder - Select a Settings File	
[walkorga] [Wideinh] [Wideinh1] [Z Score Coherence Demo] [Z Score Coherence Range Training] [Z Score Demo Four Coherences Normal] [Z Score Phase Training Demo] [Z Score Theta Beta Ratio Training Demo] [Z Score Theta Beta Ratio Training Demo] [Z Score Training Five Coherences Normal] [Z Score Training Five Coherences Normal] [Z Score Training I using Applied Neurosciences DLL] [Z Score Training with Flash Games Enabled] [z-Heg] [z-Hiniq]	Z Score Training I using Applied Neurosciences DLL OK

Using your new folder, or an existing folder, you can then select "View or Change Settings" to see the following control:

Setup Options					
Read/Write Settings File	Current Trainee/Study: Standard Test Study				
Data Channels	NCHANS: 2 SRATE: 2 COM: 4 - SUMCHANS:C SITES: 01 - A1 - 0z - A	56 FILTER: 3 ARTIFAC DFF - SAVEEEG:OFF - P-I 2 - 02	T: 240 uV ⊃:ON		
Frequency Bands	Theta:4.0-7.0 Alpha:8.0	-12.0			
Training Protocol	GO: 1:Theta(3.0) 1:Alpha(2.0) 2:Theta(3.0) 2:Alpha(2.0) STOP: (none) AUTO:ON:50/20/10 AUTOUPDATE BEFORE EACH RUN				
Display Options	Display: wave, filt. wav	ve, therm,			
Feedback Control	Sound: Event Sound O	N			
Session Control	40 SESSIONS -NO BAS PAUSE BETWEEN RUI	ELINES-40 RUNS OF L NS-SESSION TYPE: Sim	ENGTH: 1.0 MIN–NO ulation		
CLOSE	PRINT SETTINGS	Event Wizard	USE THESE SETTINGS		

If you used an existing folder, to load in the starting settings, press "Read/Write a Settings File and select the Z Score training:

Read or Write Settings File	
Settings File Name:	Note: Use this screen to manage your
[piano and violin alpha training two modes with high violin] [psmr] [ptheta] [Relax alpha training with Elash Games via, Event Wizard]	Settings File library. You can always change settings within any trainee/study folder, without using this screen.
[Relax] [S-DEC-1F] [Sharp single component squash with Flash Games via. Event Wizard]	Create a New Settings File
[Sinarp] [test event wizard] [testeven] [theta beta ratio training]	Save Settings To This File
[tom new band definitions] [UIHY2XS5 multiple threshold downtraining with multiple (chord) sounds] [UIHY2XS5] [UIHY2XS5]	Settings Description: Z Score Training Lusing Applied
(walkaipi) (walkorga) (Wideinh) Wideinh1	Neurosciences DLL Directory:
[Z Score Coherence Demo] [Z Score Coherence Range Training] [Z Score Demo Four Coherences Normal]	/brainm.20/settings/Z Score Training I using Applied Neurosciences DLL
[Z Score Phase Training Demo] [Z Score Theta Beta Ratio Training Demo] [Z Score Training Five Coherences Normal] [Z Score Training 1 using Applied Neurosciences DLL]	Read In Settings From This File
[Z Score Training with Flash Games Enabled] [z-Heg] [z-Miniq]	Cancel OK

Once your folder is started, you can press Data Channels to get the following control panel:

Data Channels			×			
Channels One Two AUX	Filter Order • 3 (faster response, less selective) • 6 (slower response, more selective)					
Sum-Channel N O ON 📀	el Mode: Amplitude Scale • OFF • Peak-to-Peak • RMS					
Save EEG to Di	Save EEG to Disk: ON OFF 240 microvolts					
Input Notch Filt Input Notch Filt	ers n Filter	✓ 50 Hz Notch Filter				
EEG Data Sam C 120 s	pling Rate sps	• 256 sps				
COM Port Selec Enter COM Por	;t t Number (1, 2, 3,, 32) 4				
Search	this PC fo	r Available COM Ports				
Cancel	Cancel Electrodes & Trainee Info OK					

Then press "Electrodes & Trainee Info to see the following control panel:

Electrode and	Trainee Information
Active 1	Reference 1 GROUND Reference 2 Active 2 A1 Oz A2
	FP1 FP2 F7 F3 Fz F4 F8 T3 C3 Cz C4 T4 A1 T5 P3 Pz P4 T6 A2 O1 Oz 02
Age: (option	al - must be nonzero to use Z-Score Training) 39 Condition: (required for Z-Score Training
Cancel	© eyes open © eyes closed OK

Inspect the Electrode and Trainee Information control panel, and ensure that all information is correct. Make changes as necessary for your trainee. Note: if you set the trainee age to 0, you will "turn off" the Z Score training. This is the recommended way of making the Z Score training software inactive when you do not wish to use it.

Theses changes will be saved and used when you press "OK" and "Use These Settings" on the appropriate screens. Then when the software is started, the entered values will be used.

Note that it is not necessary to exit the training screen to make changes to this (or any) controls. You can simply stop the training screen, return to this control panel, make changes, and then restart the training screen (by pressing "GO"). This will allow you to change from eyes open to eyes closed, for example, without having to exit the training screen and start a new session.

You may return to this control panel at any time during the training by clicking on the title bar of the "Setup/Home Screen", and you may make changes to this screen. Then, use "OK" and "Use These Settings" to save the settings. The next time you press "GO" on the training screen, the new settings will be used.

Z Scores will automatically be computed for all possible values, and results can be displayed and trained using the BrainMaster Event Wizard. The Z Score variable names and usage are described in the "Data Dictionary for the Event Wizard" in the BrainMaster 2.5SE documentation. The following event shows a simple way to use the Z Scores:

If you wish, you can reprogram the BrainMaster built-in digital filters (and FFT bins) to match those in the Z Dll. This will make interpretation and use of the Z information

simpler and more consistent. The bands are set this way in the Demo settings files provided:



When you press GO, if Z Scores are enabled and the age is not set to "0", you should see a dialog like the following:

master 2	25 🛛 🕅
!	Initializing Z Score Training: Age: 54 Eyes: open Sites: O1: (BMr 25 -> NG 8) O2: (BMr 27 -> NG 9) Sampling Rate: 256 (to NeuroGuide = 128) Do you wish to use these parameters for Z-Score training? <u>Yes</u> <u>No</u>

If you wish to continue with EEG training without Z Scores, or if you need to change some of the parameters, simply press "No" now. If you press "Yes", one of two things will happen:

You may see a licensing control panel for the Applied Neurosciences software. If so, you will need to get your "A" key and then contact the manufacturer for a "B" key:

ANI Biofeedback Security Key	×
Security Key A	-1
MFRB 04RB EA47 IKIV 49WT IODM	
Security Key P	2
QK <u>C</u> ancel	

Communicate this number to Applied Neurosciences, Inc. or to BrainMaster Technologies, Inc., and you will be able to purchase a B key to use the software. Once you have licensed the ANI Biofeedback software, you will not see this screen again. You will see the following dialog after licensing the software, and in the future, you will see the following dialog immediately after pressing "GO":

master	25 🛛 🔀
⚠	Z Score training initialized. Z Scores will be computed.
	OK

Press "OK", and the system will go through its normal starting process, and then prompt you to press "OK" when the signal is OK:



After your press "OK" and the training screen starts, you should see a screen like the following:

🔯 Training/Control Screen - Brai	inMaster 2.5	ise		
Data Display Ereq.Bands Color Sou	ind			
GO STOP Window CI	ock: 3	8:30 Points:	000	Close
System is Idling		Check Signa	I	
EEG CHANNEL 1 MMWWWWWWWWW	the work of the second	hay have a provide the second s	www.there	Why 4.0 sec.
EEG CHANNEL 2 MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM	WWWW	NAAMAAAAA	internet was the second	₩ ₩₩ ₩ 4.0 sec.
Component A	mpl(u¥)	% Full	Scale: 12.8	
Delta(1.0-4.0):Theta(4.0-8.0):Alpha(8.0-12.5):Beta(12.5-25.5):Beta 1(12.0-15.5):Beta 2(15.0-18.0):Beta 3(18.0-25.5):Gamma(25.5-30.5):	En 6.3 3.4 1 2.9 1 7.3 3 1.2 4.3 1 5.0 2 2.3 1	ergy 6 10.0 - 12 11 5.0 - 1 38 4 10 Event: 1, 22 10 10.0 -	₩₩₩₩₩₩ ×=5 + ZAP1T;	ትላካላት ትላካ
EVENT CONDITIONS: 1 if EQN: GT 5.0 do tone : 2 if EQN: LT 5.0 do tone : 3 if EQN: GT 5.0 do nothing :	VALUE % Tirr 4.9 67 5.1 51 4.4 83	ne 5.0 - tra Event: 2, 10.0 - 5.0	ስምላትላ በምሳትላ ×=5 + ZAP1A; «የምሳሳት በምሳት	۵۳ ^۰ ۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰

The Z Scores are shown in the graphs at lower right, and can be used for training. For convenience, we add the value 5.0 to each Z score, to make a positive number. Thus, when a Z score is 0, the graph is at 5.0.

Note: When the Z Score training is running, your PC will use more of the processor. You should expect a small (3-5%) increase when this is being used. On a typical 1GHZ processor, the BrainMaster software with Z Scores uses between 3% and 10% of the CPU, compared to 0% - 2% typically with the BrainMaster 2.5SE software alone.

You can use any training methods with Z Scores through the Event Wizard. You can also use any screen configuration(s) you like. The Z Scores used in the Event Wizard will show up on the Text Stats panel, and on the Event Trends panel. Note that the Event Wizard automatically computes the percent time meeting criterion for any events. Thus, in the example below, the Text Stats displays the current value, as well as the percent time that each Z Score is above (or below) the "normal" value, based upon how each event is defined:

🔯 Training/Contro	ol Screen - Brai	nMaster	2.5SE		
<u>D</u> ata Display <u>F</u> req.E	Bands <u>C</u> olor <u>S</u> ou	ind			
GO STOP	Window CI	ock:	39:19	9 Points: 000 Close	
System is Idling	System is Idling Check Signal				
Component		multuVI	%	Full Scale: 10.7	
component		mpilati	Energy	10.0	
Delta	(1.0-4.0):	5.7	6		
Theta	(4.0-8.0):	4.5	11	A A A Marsher & A Marsher A A	
Alpha	(8.0-12.5):	5.4	9	5.0 - Wall bold what have the state that the second	
Beta	[12.5-25.5]:	9.6	33		
Beta 1	(12.0-15.5):	5.9	5		
Beta 2	(15.0-18.0):	7.1	8	Event: 1, x=5 + ZAP1T:	
Beta 3	(18.0-25.5):	12.6	19		
Gamma	(25.5-30.5):	4.6	12	10.0 -	
EVENT CONDITI	ONS:	VALUE	% Time		
1 if EQN: GT 5.0	l do tone :	4.2	73		
2 if EQN: LT 5.0	do tone :	5.0	48		
3 if EQN: GT 5.0) do nothing :	6.9	77	Event: 2, x=5 + ZAP1A;	
				10.0	
				$5.0 - \frac{1}{100}$	
				Event: 3, x=5 + ZAP1B;	

Note that you can use the "damping factors" in the Event Wizard to create time-averages of any variable, including the z scores. The following example shows the effect of a damping factor of 10:

🕅 Training/Control Scre	en - Brain	Master	2.5SE				
Data Display Ereq.Bands	<u>Color</u> <u>S</u> ound	ł					
GO STOP Wind	low Cloa	:k:	39:25	Points:	000	Close	
System is Idling			Ch	eck Signal			
Component	Ап	Nulla	%	Full Sca	ale: 10.7		
		·F·(-·)	Energy	10.0 -			
Delta (1.0	1-4.0):	4.1	6				
Theta (4.0	1-8.0):	6.4	11				
Alpha (8.0	1-12.5]:	3.7	10	5.0		~~~~~	- 5.0
Beta (12	.5-25.5):	7.8	29				
Beta 1 (12.	.0-15.5):	4.9	5				
Beta 2 (15.	.0-18.0):	7.7	7	Event: 1, x=	5 + ZAP1T:		-
Beta 3 (18.	.0-25.5):	6.1	15				- 12
Gamma (25.	.5-30.5]:	5.0	10	10.0			
EVENT CONDITIONS:	۷	ALUE	% Time	5.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		- 5.0
1 if EQN: GT 5.0 do to	ne :	5.6	97				
2 if EQN: LT 5.0 do to	ne :	4.9	68	a			
3 if EQN: GT 5.0 do no	othing :	5.6	98	Event: 2, x=	5 + ZAP1A;		
				10.0			
				5.0			≤ 5.0
				Event: 3, x=	5 + ZAP1B;		

In the following example, the BrainMaster component amplitudes are plotted along with the Z Scores as trend plots. The concordance between the raw amplitude scores and the Z sores can be seen in the signals.

🔯 Training/Control Screen - BrainMaster	r 2.5SE
<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:	00:41 Points: 038 Close
In Playback Mode	View Playback
Full Scale: 26.6 microvolts	Full Scale: 26.6
20.0 -	20.0 -
10.0 - Many MMMM	3.0 10.0 - Am MAN 5.0
	Event: 1, x=5 + ZAP11;
20.0 - 1	20.0 -
	10.0 - MM
Alpha	Event: 2, x=5 + ZAP1A;
20.0 -	20.0 -
$10.0 - m_{\rm W} M_{\rm W} M_{\rm W} M_{\rm W}$	10.0
Beta	Event: 3, x=5 + ZAP1B;

The following screen shows the live "Z Score Panel" that is available on the training screen whenever Z Scores are used. This panel shows all 76 available Z Scores. The Z Scores are damped, to provide a slower time course than the standard, faster moving training variables. The Z Scores are color coded, to show when they exceed the normal limits. High Z Scores are colored yellow (+1 SD to +1.5 SE), orange (+1.5 SD to +2.0 SR) and red (+2 SD and above), and low Z Scores are colored Green (-1.0 SD to -1.5 SD), blue-green (cyan) (-1.5 SD to 2.0 SD) and blue (-2 SD and below). This provides a real-time "report" of the Z Scores, as the training or monitoring session progresses.

🕅 Training/(Control S	icreen - I	BrainMaster	r 2.5SE										
<u>D</u> ata D <u>i</u> splay	Ereq.Ban	ds <u>C</u> olor	Sound											
GO STO	OP W	/indow	Clock:	39:42 Points:	000	Close								
System is I	ldling			Check Signal										
EEG CHAN	INEL 1	mana	www.Wx	amanananana hara	than 14 m	Marry	hannannanna	product of the second	freed on the second	And 14, 10-14, 1944	WLMLMW	~4/wA/\/p	non many harring the	/ 8.8 sec.
EEG CHAN	INEL 2 ₩₩\\\/\ ₀ ₩	Mar M	www.angaal	mmongament Activ	mannan	Worker	MAN AND MUNICIPAL	rvaNera a	-MyMMAA	www.	/~~{~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	wal pronound	nere and	8.8 sec.
1								Abs	Rel	Rat/T	Rat/A	Rat/B	Rat/G	
				5 60 (Delta	0.8	0.8	-0.2	-0.2	-0.2	-0.2	
				2 8			Theta	1.0	1.0		0.4	1.8	0.4	
				S AE S			Beta	-1.6	-2.1			1.0	-0.2	
				₹ ⁴⁰			Beta 1	1.0	0.8					
				8 3			Beta 2	-0.0	-0.2					
			11	5 30 5			Beta J Gamma	0.9	0.8					
			~				Delta	-2.7	-3.2					
			5				Theta	0.9	1.0					
				<u>∽</u> " ∽			Alpha	0.4	0.5			-1.9	-1.9	
			~				Beta 1	-0.0	-0.1					
			<i>ـ</i> د				Beta 2	0.5	0.5					
							Beta 3	0.4	0.4					
							Gamma	0.7	0.7	O-h		Diana		
							Delta	Asy 2 3	m	Coh		Phase -0.2		
							Theta	0.2				2.5		
							Alpha	-0.4		0.2		-0.8		
							Beta	-1.7		-2.1		2.1		
							Beta 1 Beta 2	-1.0		-0.8		0.8		
							Beta 3	-0.8		-2.3		2.9		
							Gamma	-0.4				-0.1		

Playing back files:

If you have the Z Score Training enabled, and you select files for playback, the system will automatically detect the sensor locations and eyes (open or closed), if these were set when the data were acquired.

Select Input File	е	Σ	
Filename: e0	100201.e02		
Len: 60 sec (2 chans), 120 sps, 2E F3	3-LE-GND-LE-F4 ASSESSMENT	
	e0100101.e02	~	
	e0100201.e02		
	e0100301.e02		
	e0100401.e02		
	e0100501.e02		
	e0100601.e02		
Cancel	e0200101.e02		
	e0200201.e02		
	e0200301.e02		
UK	e0200401.e02	×	
	-		
Path: c:\brain	m.20\studies\horvaio1\		

When you select a playback file and hit "OK", then if the age of tehr trainee is other than "0", the system will attempt to set up the Z Score mechanism for playback. You should see a dialog like the following:



When you hit "OK" the system will initialize the Z Score system. If it is successful, you will see a dialog like the following:



Hit "OK" to proceed, and the playback will begin.

Note: For records made with software before the March 2006 software, the data keys will not contain the age or the eyes condition. When playing back such records, you should go to the following screen (the button for this control is is found on the "View or Change Settings/Data Channels" control panel)



and make changes as necessary, so that your playback contains the correct information.

Built-in Settings Files.

The following Settings files are provided in the 2.5SE April 1, 2006 release, for initial use:

- Z Score Training I Using Applied Neuroscience DLL
- Z Score Coherence Demo
- Z Score Coherence Range Training:
- Z Score Phase Training Demo
- Z Score Theta Beta Ratio Training Demo
- Z Score Demo Four Coherences Normal
- Z Score PercentZOK

To use these settings files, either create a new folder, or select the "test" folder, or select another folder to work in. Then press "View or Change Settings / Read/Write a Settings File". Then select the name from the choices, press "Read Settings from this File" and "OK". Then you will have the settings loaded, into the current folder, to work with.

These settings files provide starting points to design further protocols. For example, sounds can be added to the Event Wizard settings, to provide training based upon the Z Scores. Some of the files already demonstrate this.

Any panels can also be added. The raw and filtered waveforms, BrainMirror displays, or other panels can be used, as required in any of these designs.

The files marked "Demo" are set up as simulations. To use them for training, use the "Session Control" panel, and change them from "simulation" to "training".

These files are described in the following descriptions.

Z Score Coherence Range Training:

This is an example of a protocol in which the Z score of the alpha coherence is trained within a range, being rewarded when it is within 1 standard deviation of normal:

🕅 Training/Control Screen - Bra	ninMaster 2.5SE	
Data Display Freq.Bands Color So	und	Deinte: 145 Close
do stor mindow c	30:0	
System is Idling		Check Signal
		and also r
	March Marchalman	WW////////////////////////////////////
, the de ΩΩ de the the the	. LIAI kahán Alb	and the state of the second in
		a 1 a
EEG CHANNEL 2	Came Manage	14. M. Male Addut Black and a soon
international strategies and a strategiest	V HAMMAN ALAL A LA	WANTA WANT AND A AND A AND AND AND AND AND AND AND
, v (2)	3 . Si	Evil Posta: 9.0
Component	Ampl(uV) %	Full Scale: 8.9
Delta (1.0-4.0):	3.4 4	
Theta (4.0-8.0):	6.8 8	
Alpha [8.0-12.0]; Beta (12.0-25.5);	4.8 9	÷
Beta 1 (12.0-25.5)	52 9	
Beta 2 (15.0-18.0)	3.0 10	
Beta 3 (18.0-25.5)	10.6 16	
Gamma (25.5-30.5)	3.2 9	
		6.0
EVENT CONDITIONS:	VALUE %	
1 if EQN: GT 4.0 do tope :	25 24	
2 if EQN: GT 6.0 do inh. :	2.5 0	│ <u>ॊ╊<u></u><u>║┟╎</u>╢──<u>╟</u>╢<u>╟╢</u>┠<u>╢</u>┣╢┣┰┢─┤┤</u> ╏
		1 17 117 18 8 8 10 10 10 10 10 10 10 10 10 10 10 10 10
		T TA A A A A A A A A A A A A A A A A A
		I I I I I I I I I I I I I I I I I I
		2.0 - 10 10 0 0 0 1 1 1 1 1 1
		Events 1-2: x=5 + 2004;

Z Score Coherence Demo

This file runs the BrainMaster coherence alongside the Z Score coherence:

Sounds can be produced by either the built in "coherence" sounds, by the event sounds, or by a combination of both.



Z Score Phase Training Demo

This file demonstrates training the phase difference between two signals, using the Z phase metric.

Training/Contr	ol Screen - Brai	nMaster	2.5SE				
<u>D</u> ata Display <u>F</u> req.	Bands <u>C</u> olor <u>S</u> ou	nd					_
GO STOP	Window Clo	ock:	39:3	Points:	000	Close	
System is Idling	J		С	heck Signal			
EEG CHANNEL	1 White Way My re	NUWAY	h.M. M.	hhundh	www.www	M/MM ¹ 4.0	sec.
EEG CHANNEL	214 MWWWWWW	Nuntipet	wy. With	pro And Andrews	wq _{all} Addibillara	WW 4.0	sec.
Component	A	mpl(u¥)	%	Full Sc	ale: 12.8:		
Delta Theta Alpha Beta 1 Beta 2 Beta 3 Gamma EVENT CONDITI 1 if EQN: GT 5.	(1.0-4.0): (4.0-8.0): (8.0-12.5): (12.5-25.5): (12.0-15.5): (15.0-18.0): (18.0-25.5): (25.5-30.5): ONS: Odo tone :	6.1 8.0 6.5 9.8 1.5 3.9 3.6 VALUE 6.4	Energy 7 12 9 32 8 8 15 13 % Time 71	10.0 - 5.0 -			5.0
				Event: 1, x-	=5 + ZPHG;		

Z Score Theta Beta Ratio Training Demo:

This demonstrates using the Z Score for the Theta/Beta ratio as a training variable. At the same time, the theta and beta amplitudes are monitored using the thermometers, and the Trend Text panel.

🕅 Training/Control Screen - BrainMas	iter 2.5SE			
Data Display Ereq.Bands Color Sound				
GO STOP Window Clock:	39:23 Points: 000	Close		
System is Idling	Check Signal			
EEG CHANNEL 1 MWWWMWWWWWWWWWWW	Such the many company of the second	in Mary Marin Marin	Manager and Man	7.0 sec.
95 95	Component	Ampl(u¥) %	Full Scale: 12.8	
	Delta (1.0-4.0)	: 3.5 3		
	Theta (4.0-8.0)	9.0 13		
	Alpha (8.0-12.5	i: 3.5 12		
	Beta (12.5-25	5]: 16.2 33		
	Beta 1 (12.0-15	.5) 3.6 4		
	Beta 2 (15.0-18	.0): 4.8 11		
	Beta 3 (18.0-25	.5]: 7.6 17	10.0 -	
	Gamma (25.5-30	.5): 5.2 15		
0.0 0.0 0.0	EVENT CONDITIONS:	VALUE %		
		Lime		
Theta Beta	I IT EQN: LI 5.0 do tone :	5.4 63		
			S.0 We want and S.0	
			Event: 1 x=5 + 7PB1TB'	

Z Score Demo Four Coherences Normal: This protocol provides reward tones when four selected coherences are within 2 standard deviations of normal:

🔯 Training/Control Screen	- BrainMaster 2.	5SE			
Data Display Ereq.Bands Cold	ar Sound	_	_		
GO STOP Window	Clock:	7:22 Poin	ts: 000	Close	
System is Idling EEG CHANNEL 1	n MM MMM	Check Si	gnal MMMMM	Hullion yo	and many hour hand and the second and the second and the second second second second second second second second
EEG CHANNEL 2	NWWWWWW	lann yw yw	how when	WWW/W	when any a will be the approximation and an analy and when a some
Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0)	Abs Rcl -0.3 -0.4 0.2 0.1 -0.1 -0.2 0.4 0.5 0.9 0.9 0.3 0.3	Rat/T F -0.3 -1 -1	tat/A Rat/B 0.3 -0.3 0.1 -0.1 -0.5	RaVG -0.3 -0.1 -0.5 -0.9	Full Scale: 7.4
Beta 3 (18.0-25.5) Gamma (25.5-30.5) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0) Beta 3 (10.2-25.5)	0.5 0.5 0.5 0.5 0.3 0.0 0.3 0.0 0.7 0.0 0.9 0.0 0.5 0.0 0.6 0.0	0.0	0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	5.0 -
Gamma (25.5-30.5) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.5)	0.7 0.0 Asymmetry -0.0 -0.1 -0.1 -0.2 0.1 -0.2 -0.1 -0.2 -0.1 -0.1	Coherence -1.8 -1.9 -1.4 -2.1 -1.4 -1.2 -1.0 -1.6	Phase Differ 1.8 1.3 0.9 0.9 1.1 0.8 1.1	ence	2.0

The following is the setup for the event. It uses the built-in "Range" function to define a derived training variable that has the value 4 when all four coherences are within 2 standard deviations of zero (normal).

Event Wizard Designer for BrainMaster			
EventNumber: © 1	14 0 15 0 16	his Event Is:	C Disabled
Event Condition: Damping Factor: IF: Use Equation: Date International I		/isibility: • Visible	C Hidden
Constant Scale Factor: 100 Offset: 0.0 Color:			
Lheck Equation x=Hing(2CUD,2,0)+Hing(2CUT,2,0)+Ring(2CUA,2,0)+Hing(2CUB,2,0);	MIDI Sound Properties:		
RULE: IS GREATER THAN:	Starting Note:	49 A (880.0)	▼ 1 to 88
Ilee Entered Value: V Alpha V 20	Instrument:	16 Organ 1	✓ 128 choices
	Playing Style:	Sustained	Percus. or Sus
Constant: 3.0 Scale Factor: 100 Ulfset: 0.0 Color:	Modulation:	Amplitude	Ampl. or Pitch
Check Equation x=APHASE+2;	Starting Loudness:	Level: 80	• 0 to 128
Note: You must press "Check Equation" to sheck and eave any sharese made to equations	Loudness Change Rate:	10	0 to 20
Note, Tou must press, check Equation, to check and save any changes made to equations	Note Change Rate:	2	• 0 to 20
Event Result:	Musical Scale (Mode):	Major (Ionian)	✓ 15 choices
	Musical Key:	A	C to B Flat
<u> </u>	Play Note or Chord:	1 Note	✓ 1 to 8 Notes
Obey Inhibits ("stops") Control MMP Player			
Event Summary. Summary for Event 1: IF:EQN: ==PnndZCDD 2.01+RndZCDT 2.01+RndZCDA 2.01+RndZCDB 2.01; IS GREATER THAN Value; 3.0	Enable All Events	Disable All Events	Data Dictionary
THEN: Play MIDI Sound MODE [®] 2 NOTE: 49 INSTR: 16 Organ 1 STVLE: Suchared MODULATION: Anglitude LOUDNESS: Level: 80 LOUDNESS CHANGE RATE: 10 PITCH CHANGE RATE: 2	Clear All Events	Show All Events	Print All Events
NET. A MODE, Major (roniari) Unionut, i Note	Halp	Cancel	

The following example shows a sinewave sweep into the system, with the BrainMaster digital filter amplitudes trended for three components on the lower left, and the Z scores for the same components trended on the lower right.

This uses the built-in settings file:

Z Score Training I Using Applied Neurosciences DLL



It shows the expected behavior. The concordance between the raw amplitudes and the Z scores is seen, as they rise and fall in a similar fashion. It is visibly evident how the Z score variable provides a metric that will occupy a range around the green line ("normal"). Z score training automatically provides this ability to train to any particular Z score, and have the details of the signals managed by the ANI Z DLL, to always provide a normalized metric.

Z Score Demo Four Coherences Normal

This design uses the "Rng" function to determine if Z scores are within a range. Four bands are used, being delta, theta, alpha, and beta. If a band is within range, its Rng function equals 1. Otherwise, it equals 0. So by training to the new variable that ranges from 0 to 4, we can provide feedback when all 4 coherences are in the normal range. This protocol also uses the animations, DVD player, and Flash Player.

The equation used for training is:

x=Rng(ZCOD,2,0)+Rng(ZCOT,2,0)+Rng(ZCOA,2,0)+Rng(ZCOB,2,0);



Four-channel Z Scores: When four channels are used, a total of

The resulting layout of the Z Score display panel is shown below:

🕅 Training/Control S	icreen - Brain	Master 3.0.3	3							
GO STOP W	vindow Clo	a ck: 38	•49 Points:	065	Close					
60-second Training EEG CHANNEL 1 MMMMMMMMMM	g Run No: 2 MAMAAAAA	itil maladal	Please perform	task! William	MM	Muruna human human phan	art N/Ma, Mud Ma	nd partnet and the MARM	1/M. which was alkalled	8.0 sec.
EEG CHANNEL 2	an su	popular en			<u>а е</u> д. Дд	an a	י אָי אָאדיווָיַיי	· A A AUTO	s Minus Asidai	-γ·γ
	WWWWW	WWWWWW	hyphony flower flower flow	WAAAAAAAA	VHVr#VM	Yournal line of a line and and an	NANNAMA	(Wywarang ^{u n} ad Ywaldyn	WUW/WWW/	₩₩₩ 8.0 sec.
whiteman	nilitarinaturitati	Marhand	wallowala	WWWW	Nr/vr/Wh	www.WWW.wyNn	untur and the second	man when when when when when when when whe	Mananan	₩ 8.0 sec.
EEG CHANNEL 4	er Managara	MANNAM MAN	phartyronorthany	Muluu	www.www.w	ar Mwilliam Warman and	NAMAPTANA	WWW WWW WWW	Managawananananananananananananananananan	₩₩ 8.0 sec.
SITES: F3 F4 (EC) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 3 (18.0-25.5) Deta 3 (18.0-25.5)	Abs 2.0 2.7 2.0 3.2 3.7 3.1 3.3	Rel -0.9 -0.3 -0.3 0.7 1.3 0.5	Rat/T Rat/A -0.6 -0.6 -0.3	Rat/B -0.6 -0.3 -1.0	Rat/G -0.6 -0.3 -1.0 -1.5	SITES: P3 P4 (EC) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 3 (18.0-25.5) Beta 3 (18.0-25.5)	Abs 2.0 2.4 2.2 3.5 3.6 3.2 3.7	Rel Rat/T -0.8 -0.3 -0.3 -0.1 0.9 1.1 0.6 1.0 0.0	Rat/A Rat/B -0.3 -0.3 -0.4 -0.4 -1.1	Rat/G -0.3 -0.4 -1.1 -1.3
Gamma (25.5-30.5) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.5)	3.3 2.0 2.6 2.1 3.2 3.4 3.0 3.2 3.3	0.7 -0.9 -0.0 -0.2 0.8 1.1 0.6 0.8 0.9	-0.5 -0.5 -0.4	-0.5 -0.4 -1.0	-0.5 -0.4 -1.0 -1.3	Gamma [25.5-30.3 Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.3) 3.5 2.2 2.5 1.3 3.0 4.0 2.8 3.1 3.0	0.9 -0.2 -0.3 0.2 -0.8 0.8 1.5 0.6 0.9 0.9	-0.3 -0.3 0.3 0.3 -0.7	-0.3 0.3 -0.7 -1.4
Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (12.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.5)	F3-F4: A 0.1 -0.1 0.0 0.3 -0.0 0.2 -0.1	C P -1.3 1.8 -1.7 1.5 -2.0 1.9 -1.9 1.2 -1.0 0.8 -1.5 1.2 -0.9 1.5 -1.5 1.0	F3-P3: A C -0.1 -1.1 0.1 -2.0 -0.4 -2.8 -0.2 -2.1 0.1 -1.1 -0.2 -1.7 -0.2 -1.0 -0.3 -1.4	P F3 1.4 2.0 2.0 1.2 0.9 1.4 1.6 1.0	-P4: A -0.1 0.6 0.2 -0.0 0.1 0.2 0.1	C P F4-P3: -0.6 0.7 -1 -1.1 0.9 0 -0.5 0.3 -6 -0.6 0.6 -6 -0.3 0.7 -6 -0.3 0.5 -6 -0.3 0.5 -6 -0.4 0.7 -6	A C P .2 -0.7 1.5 .0 -1.5 1.3 .3 -1.9 1.1 .2 -1.7 1.0 .1 -1.1 0.8 .2 -1.4 0.9 .4 -1.1 1.3 .2 -1.2 1.0	F4-P4: C -0.2 -0.6 0.0 -0.8 0.6 -1.0 0.2 -0.3 -0.2 -0.2 0.2 -0.2 0.2 -0.2 0.2 -0.2 0.1 0.1 0.2 -0.5	P P3-P4: A 0.6 -0.1 0.5 -0.1 0.2 0.7 0.4 0.3 0.3 -0.1 0.1 0.3 0.5 0.4 0.5 0.4	C P -0.3 0.4 -0.3 0.6 -0.4 0.2 -0.4 0.2 -0.0 0.5 -0.0 0.1 -0.4 0.2 -0.3 0.2 -0.3 0.2

Training using the PercentZOK function:

Event wizard Designer for BrainMaster 3.0.3			
Event Number: 🕫 1	C 14 C 15 C 16	This Event Is:	C Disabled
Event Condition: Damping Factor: Damping Factor:] [Visibility: Visible	C Hidden
Constant: Scale Factor, 100 Offset: 0.0 Color:			
Check Equation x=PercentZOK(UTHR);	MIDI Cound Describer		
Damping Factor:	MIDI Sound Properties.	37.4 (440.0)	▼ 1 to 99
Use Equation:	Instrument	102 Echo Drops	I 10 00 ▼ 128 choices
Constant: Scale Factor: 100 Offset: 0.0 Color: Color:	Plaving Style	Sustained	▼ Percus. or S
Check Equation x=CT	Modulation	Ampl. and Pitch	Ampl. or Pito
	Starting Loudness:	Level: 80	▼ 0 to 128
Note: You must press "Check Equation" to check and save any changes made to equations	Loudness Change Rate:	3	▼ 0 to 20
Event Result:	Note Change Rate	1	▼ 0 to 20
THEN: Play MIDI Sound	Musical Scale (Mode)	Major (Ionian)	▼ 15 choices
	Musical Key:	A	▼ C to B Flat
Obey Inhibits ("stops") Control MMP Player	Play Note or Chord	1 Note	✓ 1 to 8 Notes
Event Summary: Summary: EVENT 1 IS CHRENTLY: ENABLED	Enable All Events	Disable All Events	Data Dictionary
USAINDEY NO L'OBATTANI NO L'ANDREATER THANEQN: x=CT;THEN: Hay MIDI Sound MODE: 2 NOTE: 37 INSTR: 102 Echo Drops STVLE: Sursiend MIDILLATION: Ampl. and Pitch LOLIDNESS: Level. 80	Clear All Events	Show All Events	Print All Events
LOUDNESS CHANGE RATE: 3 PITCH CHANGE RATE: 1 KEY: A MODE: Major (Ionian) CHORD: 1 Note	Help	Copy Event	Paste Event
	Cancel	Lise Now	ОК

Effect of changes in window from 2 sigma to 1 sigma and back: ("u" and "U")

🔯 Training/Control Screen	- BrainMaster 3.0.3				
GO STOP Window	v Clock: 34	:01 Points: 0	Close		
System is Idling Component Delta Theta Alpha Lobeta Beta Hibeta Gamma User VALUE A x=PercentZOK[UTHR]; x=UTHR; x=E1F;	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]: [38.0-42.0]: [30.0-35.0]: RULE VAI GT ×=(GT 0.0 GT 0.5	Check Signal Grand Avg. Damp 3.6 3.4 3.8 5.2 4.8 5.1 5.3 5.4 5.3 5.1 5.4 5.3 7.1 6.6 6.6 8.4 8.6 8.8 2.1 2.3 2.1 5.4 5.4 5.0 LUE B THEN: CT; tone in orthin nothin	Avg. % Energy 3.4 4.6 6.2 5.2 7.0 7.1 5.4 13.3 0.6 5.0 7.6 10.2 6.8 12.8 17.0 9.0 32.4 24.7 2.3 1.6 3.8 4.7 9.1 9.9 4: VAL B % TIME 92.00 84.00 44.6 ng 1.90 0.50 44.6	Full Scale: 114.4	
SITES: F3 F4 (E0) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 2 (15.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.5) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 2 (15.0-18.0)	Abs Rel -0.5 -0.7 -0.1 -0.1 0.5 0.6 0.9 0.9 0.7 0.6 0.5 0.6 0.5 0.5 -0.6 -0.8 -0.1 -0.2 0.0 -0.0 0.6 0.7 0.8 0.8 0.7 0.7	Rat/T Rat/A R -0.3 -0.3 -0 -0.4 -0 -0 -0.4 -0 -0.4 -0 -0.4 -0 -0.4 -0	Rat/B Rat/G 0.3 -0.3 0.4 -0.4 0.8 -0.8 -1.0 0.4 -0.4 0.9 -0.4 0.9 -0.9 -1.0	Events 1-2:	

х

Changes in threshold ("c" and "C")

🕅 Training/Control Screen	- BrainMaster 3.0.3			. 8 🗙
Data Display Ereq.Bands Col	or <u>S</u> ound			and the second second
GO STOP Window	Clock: 30:01 Points	Close		
System is Idling	Check Sigr	nal		
Component Delta Theta Alpha Lobeta Beta Hibeta Gamma User	Bandwidth Grand Avg. [1.0-3.0]: 3.6 3.4 [4.0-7.0]: 5.0 4.9 [8.0-12.0]: 5.2 5.4 [12.0-15.0]: 5.0 5.3 [15.0-20.0]: 7.0 6.8 [20.0-30.0]: 8.4 8.7 [36.0-42.0]: 2.2 2.2 [30.0-35.0]: 5.2 5.3	Damped Avg. % Energy 3.5 3.5 6.2 5.2 5.1 4.7 9.6 6.9 5.2 5.5 11.8 9.8 5.1 5.0 13.5 8.7 6.5 6.8 16.6 19.8 8.4 8.7 22.6 28.8 2.4 2.2 2.0 2.1 4.7 4.8 7.6 8.7	Full Scale: 114.4	
VALUE A x=PercentZOK[UTHR]; x=UTHR; x=E1F;	RULE VALUE B GT x=CT; GT 0.0 GT 0.5	THEN: VAL A VAL B % TIME tone 78.00 59.00 45.2 nothing 1.00 0.00 100.0 nothing 1.00 0.50 45.0	50.0	
SITES: F3 F4 (EO) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.5)	Abs Ref Rat/T Rat -0.5 -0.7 -0.3 -0.1 -0.1 -0.1 -0.4 -0.4 -0.5 0.6 0.6 0.4 0.7 0.7 0.7 0.7 0.6 0.6 0.6 0.5 0.6 -0.4	tv¦A RatyB RatyG 3 -0.3 -0.3 3 -0.3 -0.3 -0.8 -0.8 -1.0		
Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0)	-0.5 -0.7 -0.3 -0. -0.1 -0.2 -0.4 0.1 0.0 0.7 0.7 0.9 0.9 0.7 0.7	3 -0.3 -0.3 4 -0.4 -0.4 -0.9 -0.9 -1.0		

Adding an event to monitor and possibly target the percent time that the conditions are actually met:

🔯 Training/Control Scree	n - BrainMaster 3.0.3			
Data Display Freq.Bands Co	olor <u>S</u> ound			
GO STOP Windo	w Clock: 22	:01 Points: 0	00 Close	
System is Idling Component Detta Theta Alpha Lobeta Beta Hibeta Gamma User VALUE A x=Percent20K(UTHR);	Bandwidth (1.0-3.0); (4.0-7.0); (8.0-12.0); (12.0-15.0); (15.0-20.0); (20.0-30.0); (38.0-42.0); (30.0-35.0); RULE VAL GT ×=(Check Signal Grand Avg. Dam, 3.7 3.5 3.7 4.8 4.9 4.8 5.4 5.5 5.7 5.1 5.3 5.1 6.8 6.7 6.9 8.3 8.7 8.8 2.1 2.2 2.2 5.0 5.0 5.1 LUE B THEN CI; tone	ped Avg. % Energy 3.9 5.3 5.6 5.0 11.2 8.4 5.7 10.7 7.3 5.4 7.6 8.5 6.6 15.0 11.9 8.8 2.7.7 35.3 2.3 1.8 2.8 4.8 8.5 7.3 : VAL A VAL B % TIME 64.00 59.00 54.8	Full Scale: 114.4
x=UTHR; x=E1P; x=E1F;	GT 0.0 GT 0.0 GT 0.5	nothin nothin nothin	ng 0.880 0.000 100.0 ng 54.79 0.00 100.0 ng 0.00 0.50 54.8	50.0
SITES: F3 F4 (E0) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.5)	Abs Rel -0.5 -0.8 -0.1 -0.2 0.7 0.8 0.8 0.8 0.6 0.6 0.7 0.7	Rat/T Rat/A F -0.4 -0.4 -0 -0.5 -0 -0.5 -0 -0.5 -0	tat/B Rat/G 0.4 -0.4 0.5 -0.5 0.9 -0.9 -1.0	
Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0)	-0.5 -0.7 -0.1 -0.2 0.1 0.0 0.7 0.7 0.9 0.9 0.7 0.7	- 0.3 -0.3 -(-0.4 -(-(0.3 -0.3 0.4 -0.4 0.9 -0.9 -1.1	

🕅 Training/Control Scre	en - BrainMaster 3	3.0.3		
Data Display Ereq.Bands (olor <u>S</u> ound			
GO STOP Wind	ow Clock:	15:04 Points:	000 Close	
System is Idling		Check Signa	al	
Component Delta Theta Alpha Lobeta Beta Hibeta Gamma User	Bandwidtl [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 3.5 5.0 5.0 5.4 5.5 5.1 5.3 1: 6.8 6.6 1: 8.3 8.6 1: 2.2 2.2 1: 4.9 5.0	Damped Avg. % En 3.2 3.5 3.4 5.0 5.5 9.5 5.7 5.5 13.5 5.6 5.5 12.4 6.9 7.1 17.6 8.6 8.6 27.5 2.3 2.3 2.4 4.9 4.9 4.8	Figure Full Scale: 114.4 5.5 6.4 10.3 9.7 16.7 26.8 100.0- 2.9 10.3
VALUE A ×=PercentZOK(UTHR); ×=UTHR; ×=ETF; x=ETF;	RUL GT GT GT GT	E VALUE B ×=CT; 0.0 0.0 0.5	THEN: VAL A VAL tone 47.00 59.0 nothing 0.80 0.0 nothing 17.00 0.00 nothing 0.00 0.5	B % TIME 0 17.1 0 100.0 0 17.1 50.0 Events 1-3: 0.0
SITES: F3 F4 (EO) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta (12.0-15.5) Beta 2 (15.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.5)	Abs Rel -0.5 -0.7 -0.0 -0.1 0.1 0.1 0.6 0.7 0.8 0.8 0.6 0.6 0.6 0.6 0.5 0.5	Rat/T Rat/ -0.4 -0.4 -0.4	A RayB RayG -0.4 -0.4 -0.4 -0.4 -0.8 -0.8 -1.0	
Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0)	-0.8 -1.0 -0.1 -0.1 0.1 0.1 0.6 0.7 0.8 0.9 0.7 0.7	-0.5 -0.5 -0.6	-0.5 -0.5 -0.6 -0.6 -1.0 -1.0 -1.1	

Example with a high threshold and low percent time: window 0.8 threshold 59

Example with wider window and higher percent time: window 1.3 threshold 59

🔯 Training/Control Screen	- BrainMaster 3.0	.3		
Data Display Freq.Bands Col	or <u>S</u> ound			
GO STOP Window	Clock:	7:03 Points:	000 Close	
System is Idling		Check Signa	al	
Component Delta Theta Alpha Lebeta Beta Hibeta Gamma User	Bandwidth (1.0-3.0): (4.0-7.0): (8.0-12.0): (12.0-15.0): (15.0-20.0): (20.0-30.0): (38.0-42.0): (30.0-35.0):	Grand Avg. 3.6 3.6 4.9 4.9 5.5 5.5 5.1 5.3 6.9 6.6 8.5 8.8 2.2 2.2 4.9 5.0	Damped Avg. % Energy 3.4 3.2 5.1 4.9 4.9 7.3 5.7 5.2 12.3 5.0 5.5 9.6 6.8 6.5 18.0 9.0 8.1 30.2 2.1 2.2 1.4 4.8 4.9 6.2	py Fun State, 114.4 4.4 9.3 11.6 10.5 14.3 26.4 10.0- 1.7 8.4
YALUE A x=PercentZOK(UTHR); x=UTHR; x=EIP; x=EIF;	RULE ¥ GT × GT 0 GT 0 GT 0	ALUE B =CT; .0 .5	THEN: VAL A VAL B tone 64.00 59.00 nothing 1.30 0.00 nothing 1.30 0.50 nothing 1.00 0.50	⁹⁶ 100.0 100.0 86.3 50.0 - 0.0
SITES: F3 F4 (EO) Delta [1.0-4.0] Theta [4.0-8.0] Alpha [8.0-12.5] Beta [12.5-25.5] Beta 2 [15.0-18.0] Beta 3 [18.0-25.5] Gamma [25.5-30.5]	Abs Rel -0.6 -0.8 -0.0 -0.1 0.1 0.1 0.7 0.7 0.8 0.8 0.7 0.7 0.6 0.6 0.5 0.5	Rat/T Rat/ -0.4 -0.4 -0.5	A Rat/B Rat/G -0.4 -0.4 -0.5 -0.5 -0.9 -0.9 -1.0	Events 1-3!
Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0)	-0.7 -1.0 -0.1 -0.1 0.1 0.1 0.7 0.8 0.8 0.9 0.8 0.8	-0.5 -0.5 -0.6	-0.5 -0.5 -0.6 -0.6 -1.0 -1.0 -1.1	

Training/Control Scr	een - BrainMaster 3	3.0.3		
Data Display Ereq.Bands	<u>Color</u> Sound			
GO STOP Win	dow Clock:	00:01 Points:	000	Close
System is Idling		Check Sign	al	
Component Delta Theta Alpha Lobeta Beta Hibeta Gamma User	Bandwidtl (1.0-3.0): (4.0-7.0): (12.0-12.0): (12.0-15.0 (15.0-20.0 (20.0-30.0 (38.0-42.0 (30.0-35.0	h Grand Avg. 3.6 3.6 5.0 5.0 5.5 5.5): 5.2 5.3): 6.8 6.7): 8.5 8.7): 8.5 8.7): 2.2 2.2): 4.9 5.0	Damped Avg. 2 3.7 3.3 6 4.9 4.9 6 5.5 5.9 1 5.3 5.6 1 7.2 7.2 1 8.8 8.9 2 2.3 2.2 2 4.6 7	g. % Energy Full Scale: 114.4 6.4 2.9 6.3 7.2 11.3 13.9 10.1 11.4 15.4 14.1 28.1 30.0 100.0- 2.4 1.1 7.6 7.8
VALUE A x=PercentZOK[UTHR x=UTHR; x=E1P; x=E1F;	RUL GT GT GT GT	E VALUE B x=CT; 0.0 0.5	THEN: VAL A tone 59.00 nothing 1.30 nothing 36.67 nothing 0.00	A VALB % TIME 00 79.00 36.5 0 0.00 100.0 N7 0.00 100.0 0 0.50 36.7 50.0
SITES: F3 F4 (EO) Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta 1 (12.0-15.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0) Beta 3 (18.0-25.5) Gamma (25.5-30.5)	Abs Ref -0.4 -0.6 0.0 -0.1 0.1 0.0 0.6 0.6 0.9 0.8 0.8 0.7 0.5 0.5	Rat/T Rat -0.3 -0.3 -0.4	/A Rat/B Rat/ 3 -0.3 -0.3 1 -0.4 -0.4 -0.8 -0.8 -1.0	Rat/G -0.3 -0.4 -0.6 -1.0
Delta (1.0-4.0) Theta (4.0-8.0) Alpha (8.0-12.5) Beta (12.5-25.5) Beta 1 (12.0-15.5) Beta 2 (15.0-18.0)	-0.7 -0.9 -0.1 -0.3 0.2 0.2 0.7 0.8 0.9 0.9 0.9 0.9	-0.4 -0.4 -0.6	-0.4 -0.4 -0.6 -0.6 -1.1 -1.1 -1.1	-0.4 -0.6 -1.1 -1.1

Changes in percent time as the threshold is changed:

Data Descriptions for Event Wizard Z Score Training:

The following is excerpted from the Data Dictionary for the Event Wizard. It shows the variable names and interpretations for the values accessible using the ANI Z DLL with the BrainMaster Event Wizard:

ZAP1D, ZAP1T, ZAP1A, ZAP1B, ZAP11, ZAP12, ZAP13, ZAP1G, ZAP2D, ZAP2T, ZAP2A, ZAP2B, ZAP21, ZAP22, ZAP23, ZAP2G	delta, theta, alpha, beta, beta1, beta2, beta3, gamma Absolute Power 2 channels / 8 bands
ZRP1D, ZRP1T, ZRP1A, ZRP1B, ZRP11, ZRP12, ZRP13, ZRP1G, ZRP2D, ZRP2T, ZRP2A, ZRP2B, ZRP21, ZRP22, ZRP23, ZRP2G	delta, theta, alpha, beta, beta1, beta2, beta3, gamma Relative Power 2 channels / 8 bands
ZPR1DT, ZPR1DA, ZPR1DB, ZPR1DG, ZPR1TA, ZPR1TB, ZPR1AB, ZPR1AG, ZPR1BG, ZPR2DT, ZPR2DA	d/t, d/a, d/b, d/g, t/a, t/b, t/g, a/b, a/g, b/g Power Ratios 2 channels / 10 ratios
ZAAD, ZAAT, ZAAA, ZAAB, ZAA1, ZAA2, ZAA3, ZAAG	delta, theta, alpha, beta, beta1, beta2, beta3, gamma Amplitude Asymmetry 8 bands
ZCOT, ZCOA, ZCOB, ZCOG ZPHD, ZPHT, ZPHA, ZPHB, ZPH1, ZPH2, ZPH3, ZPHG	theta, alpha, beta, gamma Coherence 4 bands delta, theta, alpha, beta, beta1, beta2, beta3, gamma Phase Difference 8 bands

NeuroGuide bands are: D: Delta (1-4), T: Theta (4-8), A: Alpha (8-12.5), B: Beta (12.5-25.5) G: Gamma (25.5-30.5), 1: Beta 1 (12 – 15.5), 2: Beta 2 (15-18), 3: Beta 3 (18 – 25.5)

Examples of Z Score Training:

x=ZAP1A;	get the alpha amplitude z score
x=ZPHT;	get the phase difference z score for theta
x=ZCO1;	get the coherence z score for beta1
x=ZPR1BG	get power ratio z score number 10 (beta/gamma) for Channel 1
x=ZAAA;	get the alpha amplitude asymmetry
x=(ZAP1T + ZAP2T)/2;	get average of z scores for theta from channels 1 and 2

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