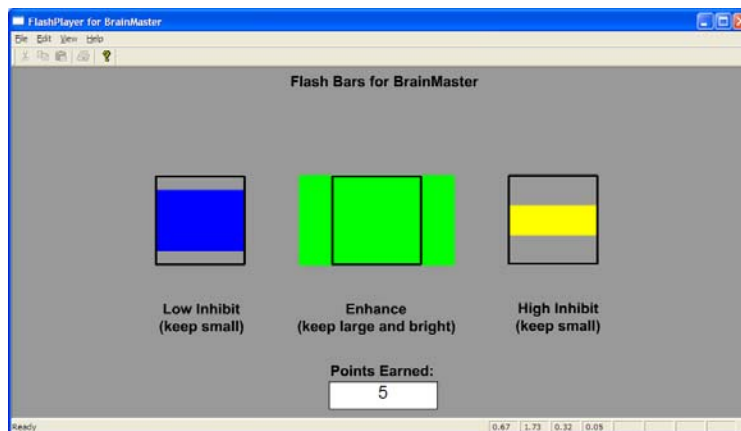


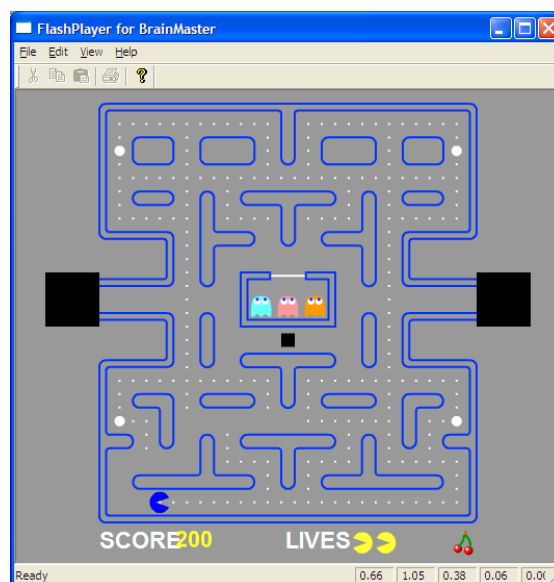
BrainMaster Macromedia Flash Player

The BrainMaster Macromedia Flash Player is a built-in extension that provides the 2.5SE software with the ability to play Flash programs in real time, and to control the programs using EEG parameters such as amplitudes, ratios, coherence, or any derived variables. The extension uses the “Event Wizard” that is also built into 2.5SE, as a way to design control protocols that can send virtually any type of EEG-derived signals to the Flash program. This makes it possible to operate custom-designed games, graphic displays, and other programs that can be written in the Macromedia Flash language. (For details on Flash, see: www.macromedia.com)

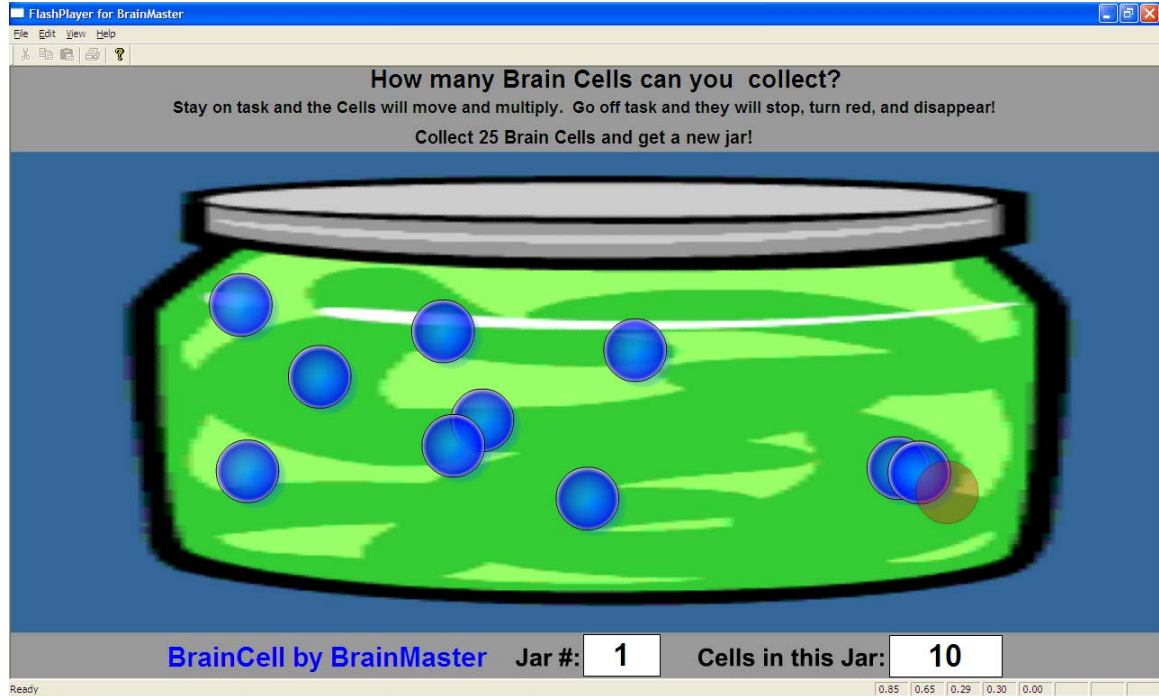
- 1) A Flash program is written or provided. Two such programs are provided with the 2.5SE software. One provides a real-time “bars” screen, shown below.



The second game screen, based on a public-domain version of a popular game, and enabled for neurofeedback, is shown below:



A third game, with a new type of visual feedback, is shown below:

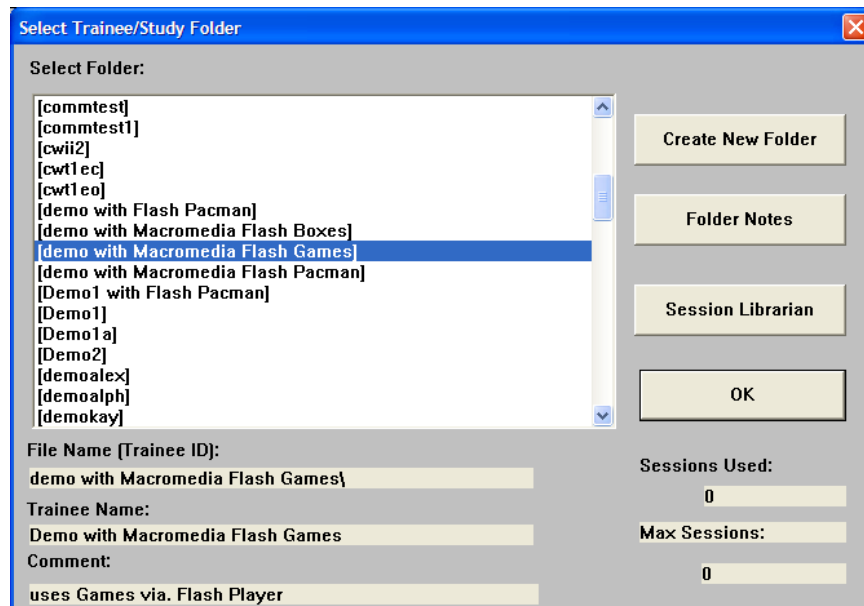


- 2) In order to control Flash programs, variables are set up using the Event Wizard. Up to 32 variables, named "in1" through "in32" can be defined, and sent to the Flash program. The values are sent to the Flash Player in real time (standard rate 30 per second). The 2.5SE software includes a demonstration folder that provides the settings needed to operate the two contributed game screens. There is also a "settings" file provided, as a starting point for designing your own protocols.
- 3) The BrainMaster software is operated in the normal manner, with all protocols, displays, statistics, etc. provided as usual. The Event Wizard automatically picks up all defined variables, processes them, and sends them to the Flash Player in real time.
- 4) One or more Flash Player windows is run, providing the real-time Flash animation. Each window can contain a different Flash program, provided that the control variables are appropriately set up. The built-in folder and settings file provided are configured to run both of the provided games, at the same time if desired. Future games can be designed to these settings, and the settings can be expanded or changed at any time, to suit present or future needs.

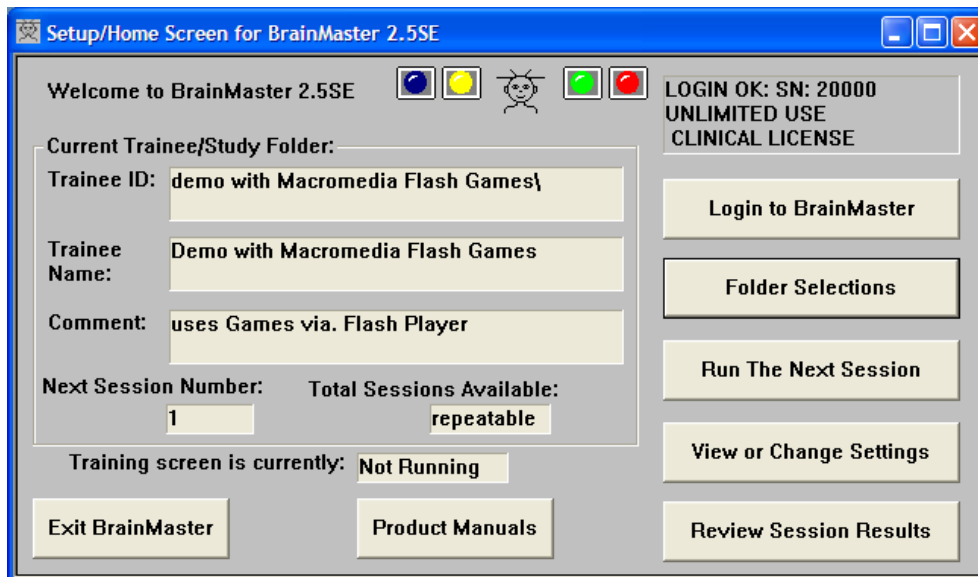
BrainMaster Macromedia Flash Player used with Bars

BrainMaster Macromedia Flash Player

To access the demo of the Macromedia Flash Player with the Bars game, use the folder labeled “**demo with Macromedia Flash Games**” as shown below. If you do not have this folder available, contact BrainMaster for the demo files and software update.

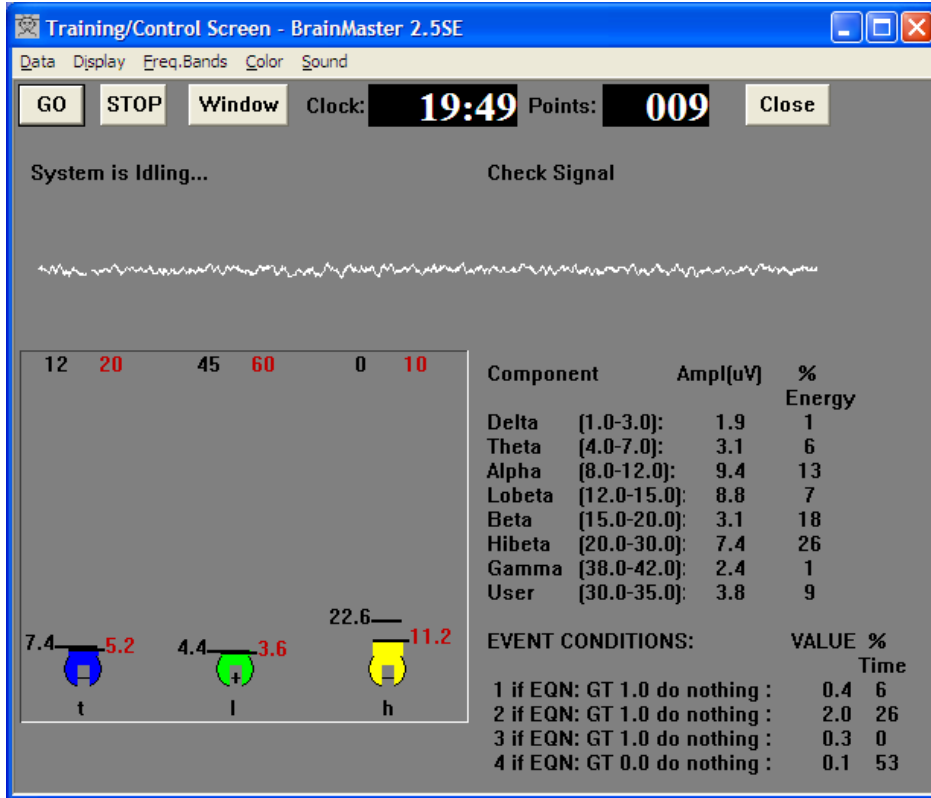


Click “OK” to get back to the home screen:

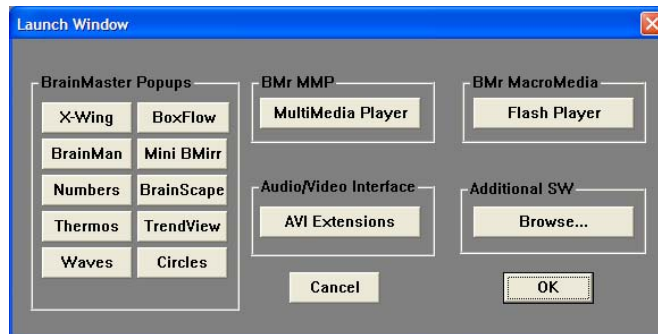


Press “Run the Next Session” to bring up the training screen:

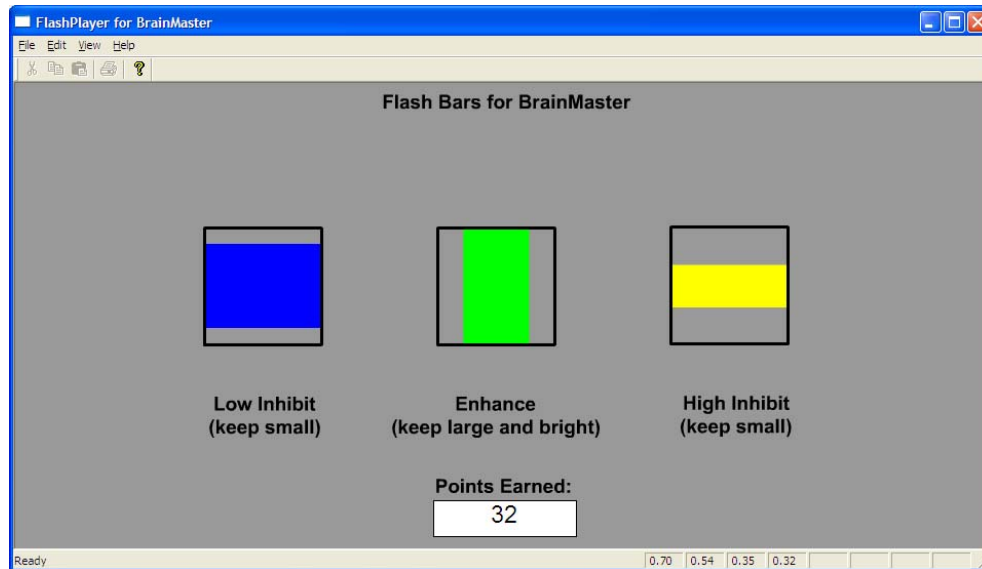
BrainMaster Macromedia Flash Player



Press the “Window” button to access the “Launch Window” Control Panel.



Press the BMr MacroMedia Flash Player button. The following screen should appear:



This screen shows colored bars for two inhibits (low and high) as well as a central training band. The inhibits grow vertically when they are large, and the central training band grows horizontally when it is large. All three bars have threshold lines shown. When the inhibits go above threshold, they cause the central (green) bar to become dimmer. When both inhibits are above threshold, the central bar is maximally dark.

The values of the four control variables are shown in the three small windows at the bottom of the screen, providing real-time information. These values show the ratio of the box sizes to the threshold size, for each of the three boxes. The points earned are shown in the large text area at the top of the screen.

Note that the values provided to the Flash program via the Event Wizard can also be damped, so that the bars will move more slowly. When this method is used, the training rewards are still computed based upon the raw, faster responding signal amplitudes. Therefore, the bars may seem to “lag” the actual system sound feedback response, which is faster because it is not damped.

How it works:

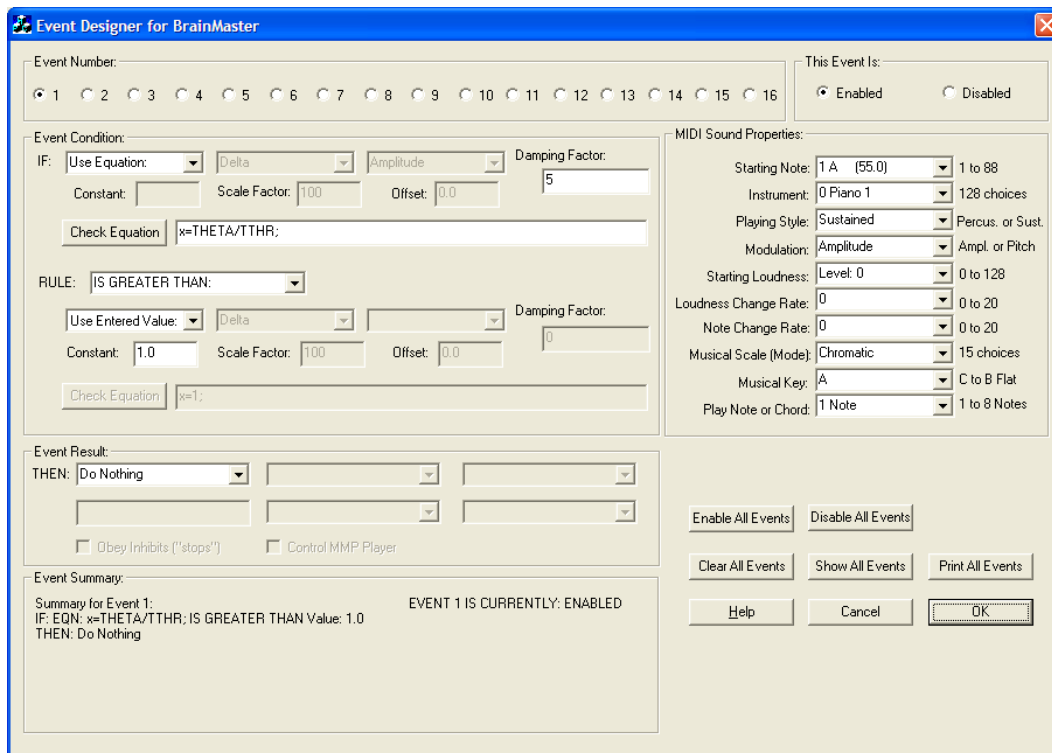
The Event Wizard is used to provide four variables, as follows:

- Event 1 (“in1”): $x = \text{THETA} / \text{TTHR}$;
- Event 2 (“in2”): $x = \text{LOBETA} / \text{LTHR}$;
- Event 3 (“in3”): $x = \text{HIBETA} / \text{HTHR}$;
- Event 4 (“in4”): $x = \text{POINTS} / 100$;

These variables will be used to send three sizing numbers to the Flash Boxes program. Each number has a value less than one, one, or greater than one, depending on whether

the component exceeds its threshold. These values will control the sizes of the boxes, and whether the highlighted “signal” box is drawn to highlight that a component is over its threshold. All these details are handled in the Flash Boxes program. All the BrainMaster software needs to do is to compute the three variables, and send them to the Flash program. By simply defining the “Event Condition” variable, the system knows to send the values in real time to the Flash program, using the variable names “in1” for Event 1, etc. The fourth equation, providing “in4”, is set to the value of points/100. The divide-by 100 is done for display reasons, as shown below.

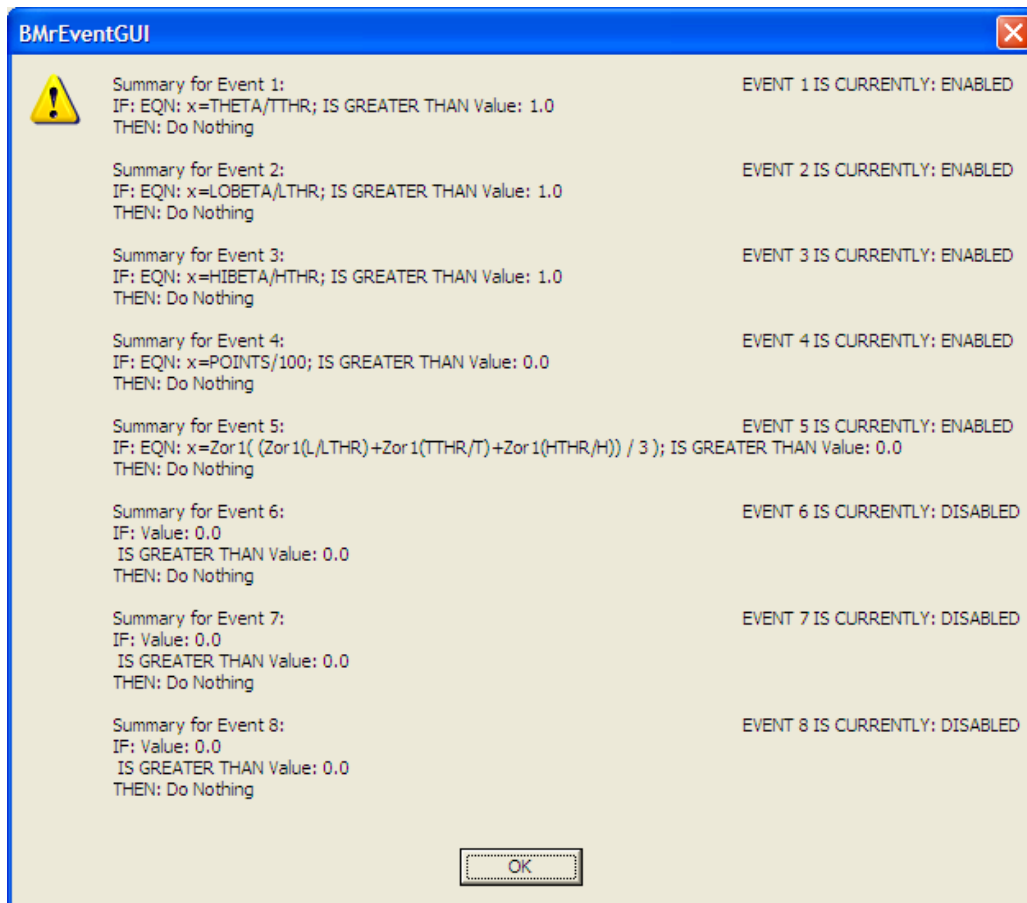
The following screen shows the Event Wizard panel for Event 1. The important factor is that for Event , the Event Condition has been set to “Use Equation:” and that the equation is “x=THETA/THR” which creates a variable that is the ratio of the theta amplitude to the theta threshold, in Event Wizard format:



Events 2 and 3 are set up in a similar manner.

The following screen shows the display provided by the “Show All Settings” control on the Event Wizard, summarizing the events defined. Note that in addition to Events 1-4 controlling the bars, Event 5 is also programmed, for use by the other game. Thus, all event settings are consolidated in the one setup screen for ease of use and re-use by other programs. The events can also be enabled to provide sounds or other outcomes by selecting the appropriate options, without affecting their ability to send data to the Flash Player. What matters is that the event “condition” quantity is defined, and the software takes care of everything else to send it to your Flash programs automatically when the system is working.

BrainMaster Macromedia Flash Player

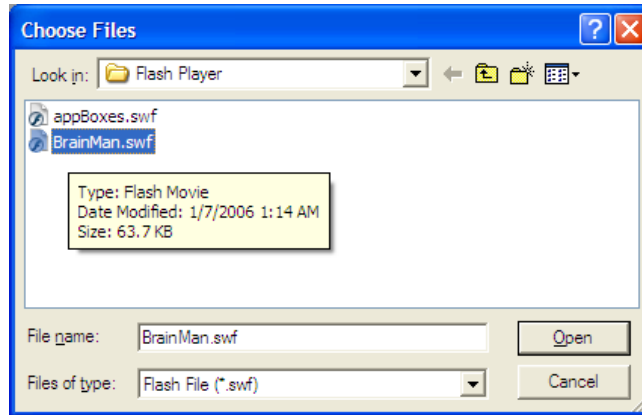


Using the Flash player with the BrainMan game:

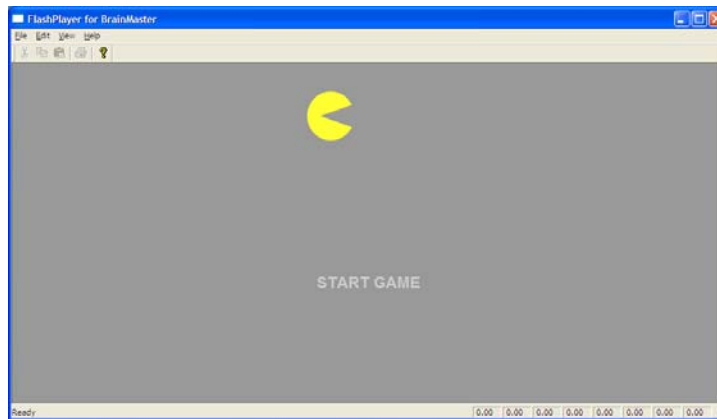
Run the training screen as above. The demo folder is usable for both the “Bars” screen, and the “BrainMan” game, and both games can be run at the same time. It is not necessary to load separate folders for the two games. It is possible to run both Flash screens simultaneously, as they “share” the data stream coming from the Event Wizard, and both use the same setups and event definitions. In fact, it is possible to run multiple copies of the BrainMan, for example, if the trainee finds that interesting.

Now activate the Window/Flash Player. When the Flash Player appears (it will show the “bars” flash screen), use the “File/Open menu to get the browser:

BrainMaster Macromedia Flash Player



You will see the opening screen:



Press Start Game:



The BrainMan game will then begin to operate. The program will then automatically run without intervention, for the remainder of the session. The BrainMan will run the maze, and the trainee will go to a new level, when each level is finished. The game will also keep its own score, based on the BrainMan's progress. This is a re-engineered Flash program that provides a reasonable facsimile of another popular game. It has a similar arcade quality look, feel, and responsiveness, as well as enhanced EEG related features.

The basic operation is that, when the trainee meets all three training criteria (as defined in Event 5), the BrainMan will move. The BrainMan can stop and start up to 30 times per second, providing real-time feedback. Thus, the rapid changes in the BrainMan's motion accurately reflect the EEG conditions, moment-to-moment. The ghosts are also animated when the trainee meets the training criteria, which is also when the BrainMan moves. When the trainee does not meet criteria, the ghosts and the BrainMan stop, and the BrainMan turns from yellow to blue.

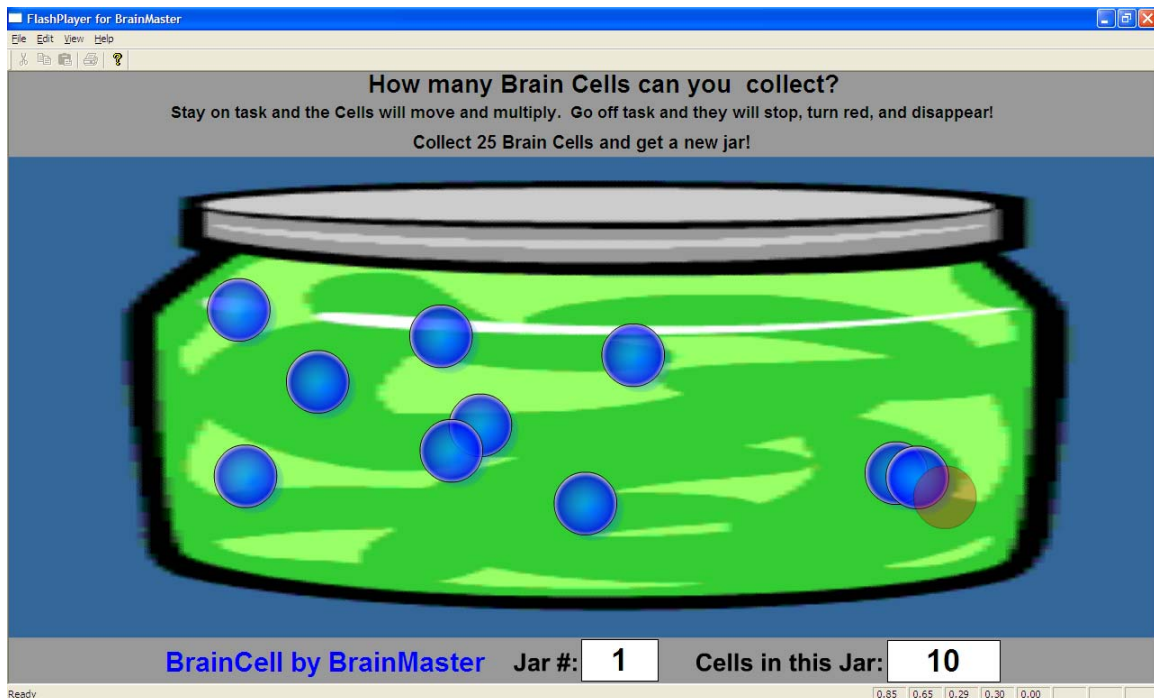
This game never runs the same way twice in a session. There are more than 16,000 combinations of paths the BrainMan can take. The program is designed to automatically tell the BrainMan which way to turn as he runs the maze. In its basic form, the BrainMan will eat the "pearls of wisdom", and make turns as best he can to seek available pearls. When faced with a choice at a wall, the BrainMan will make a random choice, if both choices are equal (pearls lie in either direction). This provides an element of variation, and no two levels will ever be played the same way. Thus every path at every level is different, and **no two games are ever the same!** This is significant for avoiding boredom, and keeping the game interesting.

Near the end of each level, the BrainMan has the ability to know roughly where the remaining pearls are, and to go after them. Thus, the trainee does not have to use the cursor keys to control the BrainMan, but the BrainMan runs the maze under automatic control, and has a certain degree of intelligence, as well as randomness, in his choices. The BrainMan does not have to run the maze the same way each time, but he is always sure to eventually complete a level, given enough time and “smarts,” as described below.

The “BrainMan” character has been provided with artificial intelligence and the ability to search the maze for rewards. The more the trainee meets the training criteria, the more successful the BrainMan will be. You may even notice that the BrainMan’s strategy (his “intelligence”) is a function of the training conditions. In other words, when the BrainMan moves, he makes decisions about where to go, based on the underlying training progress. Thus, by watching the game proceed, you may be able to get a sense of the quality of the training. For example, the more the trainee stays in the “zone”, the better the BrainMan will search the maze for rewards, and the faster the progress will be. Therefore, the time to complete each level becomes an accurate reflection of the trainee’s overall EEG condition and progress. Thus, the game also provides an ongoing mini-assessment, in that it reflect the long-term state of the trainee in the form of the appearance and behavior of the game screen.

NOTE: The training/control/assessment method described above is patent pending.

The third provided game, “BrainCell”, is shown below:



The “cells” are created when the trainee meets the training criteria continuously for a certain period of time (above ½ second). The cells move in the jar, moving quickly when

the criteria are met, and slow down otherwise. The cell motion provides fast feedback of the trainee's state. The number of cells reflects the success in keeping in state over a period of time. If the trainee falls out of state (or has inhibits) for a period of time (just under 1 second), one cell will turn red, and fade away. Thus, the cells can be both created and destroyed by the training progress. When the trainee fills up one jar (25 cells), a new jar is provided, and the sequence begins again. The cells move randomly, so that no two games look exactly the same.

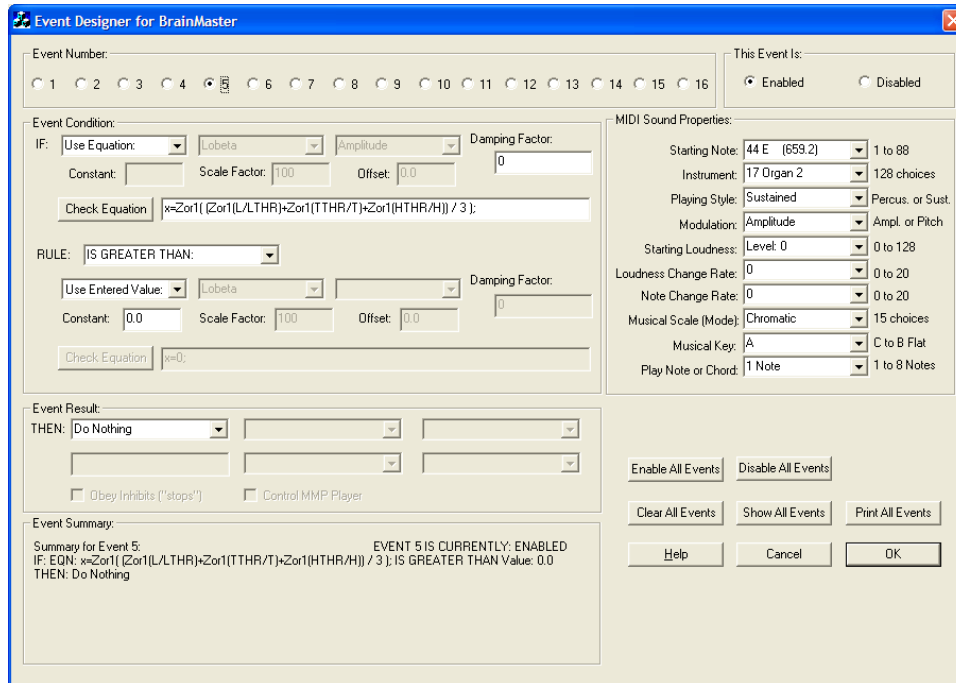
How it works:

You may observe the Flash Player status text display box number 5 (on the bottom status bar) shows either a "0.00" or a "1.00" depending on whether the training conditions are being met. When the box contains a "1.00", then the game will respond, and the BrainMan will move. When the box contains a "0.00," the BrainMan will stop moving.

The BrainMaster Event Wizard is used to send a single control variable to the MMF Player. For example, in a typical "focus" or "wideband inhibit" protocol, the following equation can be used:

$$x = \text{Zor1}(\text{Zor1}(L/LTHR) + \text{Zor1}(TTHR/T) + \text{Zor1}(HTHR/H)) / 3 ;$$

This equation uses the "zero or one" function to define a variable x so that it takes the value 1.0 only when all three conditions are met. Otherwise, it has the value 0.0. This is used as a control signal to tell the pacman game that it can move. The Lobeta must be above its threshold, and the theta and hibeta must be below their thresholds. The Zor1 function is used to convert each component condition into a value of 0.0 or 1.0, then adds them up, and makes sure the result is three (all conditions are met). The Event Wizard control screen is shown below, with Event 5 set up to control the BrainMan game.



Note that the “consequence” in the event (“do nothing”) is not important to this use, although it could be used for another purpose. It could be set to produce a MIDI sound, or other event, as desired. What is important is that the variable is defined in the “condition” part of the event. Given this, the Event Wizard will automatically send the real-time result of this equation to the Flash Player as In5, at all times.

How to use the Flash player in session folders:

The Demo with Flash Games folder is designed to run the two games shown here, and can also be used to run other games. The definitions of the input variables is generally useful for other types of displays and games. In addition, it is possible to define further training variables, since the Event Wizard can define up to 32 training variables in real time. The folder provided is a good start, in that it runs the two examples, and is also usable for future games and scenes.

You can further modify the provided settings, for any type of training you wish. The Event Wizard entries may need to be changed for your training protocol. Any Event Wizard changes you make will be saved in the folder or settings file, along with the other settings.

All Event Wizard settings and equations are automatically stored in your session folders. They are also saved in any saved settings files that you create. So the Event Wizard part of your setup is automatically stored as part of the settings for any folder or settings file.

BrainMaster Macromedia Flash Player

You can create, save, and use folders and settings files exactly as before, with the knowledge that all Event Wizard settings are sure to “come along” with the training protocols.

The 2.5SE software includes two built-in settings files to allow you to begin building training folders using the Flash Player. The first is “Focus with Flash Pacman” and the second is “Focus with Flash Boxes”. You can use either of these as starting settings, and make modifications from there, for your training requirements. Whatever changes you make in your working folders will be saved, including the Event Wizard settings and equations you define.

Since the Flash Player will operate with any training variables you design, there is no limit to the training possible with Flash Programs. For example, a control variable could be designed to allow BrainMan to train using Coherence, Phase, Asymmetry, Variability, or any combinations of these and other variables. By designing and typing in the equations you use for the control, there are infinite possibilities.

Similarly, the Flash Boxes program will reflect any three variables you choose to display. These can themselves be ratios, derived variables, or complex equations that you design, to provide the training effects desired. You can also send any variable you want into the text display window, through Event 4. This could display a percentage, a rate, a ratio or average, or any other value of interest to the training.

In summary, the Event Wizard provides a flexible and easy to modify interface to the Flash Player, as well as the ability to configure sounds and other events. By simply changing the pulldown selections, or typing in a new equation (followed by “Check Equation”), the system can train any variables or combinations you wish to define.