JEFFREY A. CARMEN, Ph.D.   **LICENSED PSYCHOLOGIST**

BIOFEEDBACK, BEHAVIOR THERAPY, PSYCHOTHERAPY   4016 Henneberry Road, Manlius, New York   13104-9567
migraines, tension headaches, pain disorders, impulse control disorders
stress management for chronic diseases   PHONE: (315) 682-5272
augmentative communication and control systems   FAX: (315) 682-4716
biofeedback and physiological data systems   carmen5272@aol.com

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OPERATING INSTRUCTIONS FOR THE EZPIR NEUROFEEDBACK SYSTEM for designs dated 02/23/2011 and beyond running BioEra version 2.3.109 and above.

These instructions assume that you have already successfully installed the software and hardware.

Before doing anything else, mount the headset as shown in this picture. This will allow the person to get used to having an unusual object mounted on the forehead. The headset should fit comfortably. The elastic should only be tight enough to prevent slippage. Since the headset functions like an infrared camera, no skin contact or skin pressure is necessary.

Next, open the Bioera program. To open the program, left click on "start", then "Programs", then "BioeraPro", then from the dropdown list click BioEra Pro. It is convenient to create a shortcut. Right click on "BioEra (console)" then click on "create shortcut". Drag the shortcut to the the Windows "Start" menu. This will start the BioEra program using Windows console which allows data logging for possible software errors.

Use of DVD's. The program requires a DVD in the drive to operate. The DVD should be placed in the drive before booting Bioera. The reason for this is so that the program can find the right drive where the movie is. If you boot Bioera first it may not find the movie. Note: Some DVD's have data written on both sides, but normally in a horizontally mounted drive, the label faces up and the data faces down.

Also, make sure the EZPIR hardware is plugged into the USB port and that the Bioera dongle is plugged into a different USB port. Non powered USB hubs sometimes cause trouble, so it is preferable to use either a separate USB port or a powered hub.

Maximizing the screen. In the upper right corner of the runtime screen you will see three tiny boxes.

These are Windows boxes not Bioera boxes. The middle box will either have a single square or two overlapping squares. If a single square appears, click on it. That will maximize the window and allow the software to fill the entire screen. Note: some people have experienced a situation in which the monitor does not display the entire Bioera screen. This is a Windows problem not a Bioera problem. To fix this, set the pixel resolution as high as your monitor allows and make sure that the aspect ratio is set to the same ratio of the monitor. This will match the Bioera screen to the monitor.

EZPIR SOFTWARE CONTROLS:

1. All the controls are found on the bar at the top of the screen. Note: Above the bar is the information describing the version of Bioera, and the name of the design. This is important to know since the designs have gone through multiple iterations. It is also important to know which version of Bioera you are using because the current design will only run on Bioera version 2.3.109 and later.
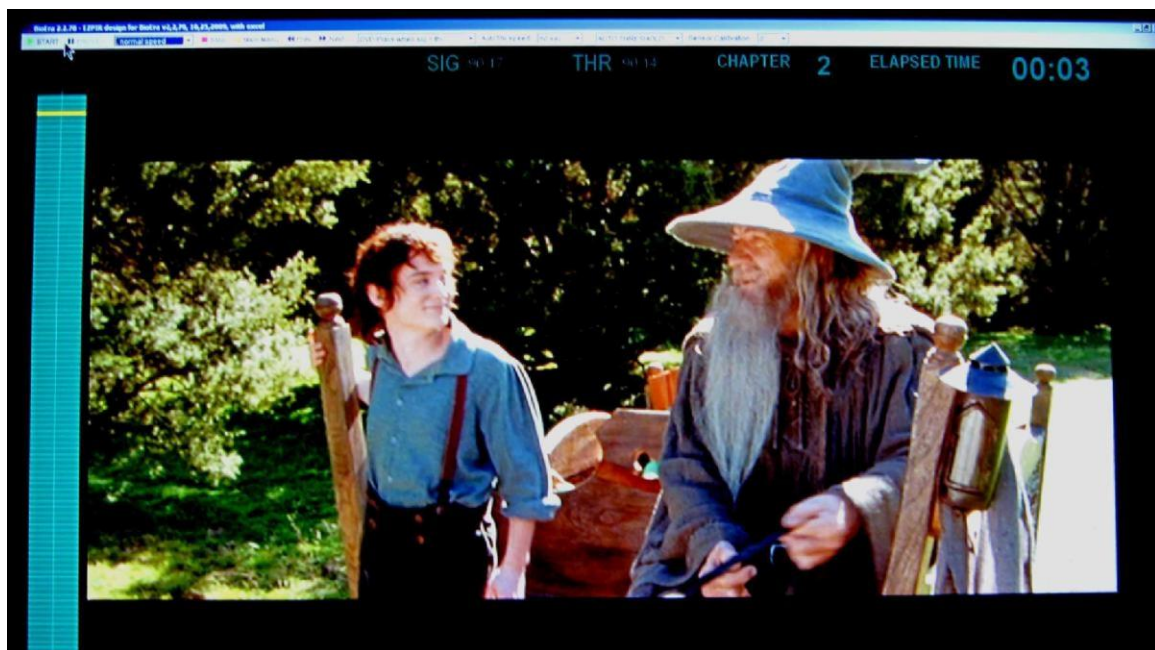
INDIVIDUAL CONTROL ITEMS:

This is the current panel, showing the control panel (top) and the numeric displays just below:
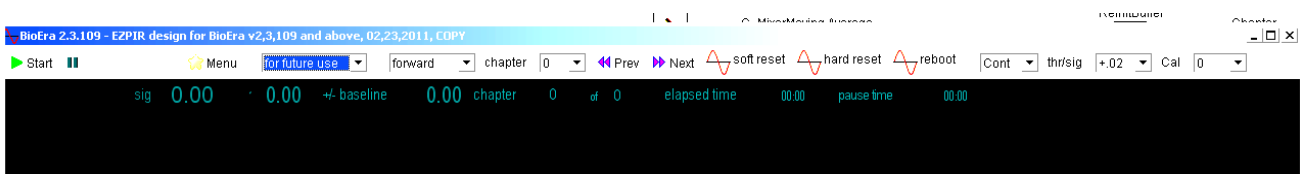
The following explains the function of each:

1. Start. This button starts the program. Note: make sure the DVD is in place, the EZPIR hardware is plugged into a USB port and that the dongle is plugged into a separate USB port. Otherwise, BioEra will just sit and wait until everything is in place. If the dongle is not plugged in, BioEra will not load. Some people have confused the dongle with a similar thumb drive. Make sure you use the correct one. Also, if the BIOS of your computer is set to boot to a usb port before the hard drive, windows may not boot. To begin, press the START button.

2. To the right of the START button is the PAUSE button. This functions like the PAUSE button on a DVD player. When pressed it will pause the movie. Note: the software also pauses the movie as part of the operation of the EZPIR system. Don't use the PAUSE button if the software is in AUTO THRESHOLD mode as it will produce conflicts.

3. To the right of the Pause button is the Stop button. This stops everything. If you click this button, everything will start over when you press START once again.


4. To the right of the STOP button is the "Menu" button.

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Note: when you play a DVD on a computer, the computer uses software to make the optical drive "think" it is a DVD player. This software emulation is never perfect. If the DVD cooperates, clicking the "Menu" button will bring you to the main menu where you can select the scene number, etc. Not all DVD's will cooperate but most will. If this doesn't work, there are other ways to navigate to the part of the DVD where you left off from the previous session. To work around an uncooperative DVD, you can use "fast forward", "chapter" "Prev", and "Next".

5. To the right of the Menu button is a blank dropdown control that is reserved for future use.

6. To the right of the "future use" button is the direction and speed control. This control allows you to select normal DVD speed functions. This includes reverse, fast reverse, forward, fast forward, and faster forward. This last item is useful for DVD's that force you to watch a bunch of trailers before the movie starts. The way it is mastered won't always let you skip them, and you can't always jump forward past them with the "next" button. "faster fwd" allows you to fly through them so they only take a few seconds. To the right of the direction/speed control are the chapter selection buttons. These are "chapter", "Prev" and "Next". These are just like the buttons on a DVD remote, except you can also select a specific chapter with the "chapter" control button. "Prev" jumps to the previous chapter. "Next" jumps to the next chapter.
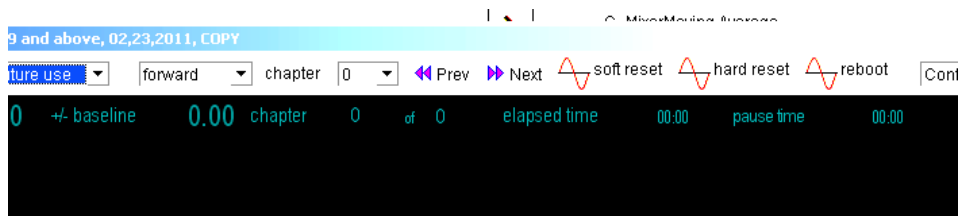
7. To the right of the "Prev" and "Next" buttons are three buttons with red infinity symbols. These are BioEra icon buttons. They have rescue functions. Please read this section very carefully.

The purpose of these buttons is to bail you out if the system does not appear to be working properly. All software can occasionally load incorrectly. This includes familiar things like word processors. However when a word processor loads incorrectly it may not be obvious. When a real time data acquisition program loads incorrectly it is usually obvious. On the EZPIR program, the threshold might seem unpredictable, or the signal levels might seem too far out of range. Or, you might just not be sure. So, there are three sequential options here, from left to right.

The "soft reset" can be pressed at any time. It will not harm or alter any function. You won't notice any effect on the operation but it may normalize the function of the system.

The "hard reset" is the next step up in severity. This reinitializes the entire design. It is more likely to correct problems related to the design not loading correctly, but all elements start over as a new session. This includes all display counters, and also the DVD starts over at the beginning. Before you try this, make sure you note the DVD chapter so you can return to it.

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The "reboot" option closes the design and reloads BioEra and the design. This is even more drastic than the "hard reset".

Beyond these three things, if you still seem to be having problems, there are more things you can do, in this order of increasing severity:

a. Close BioEra, restart windows, then restart BioEra.
b. Beyond that you can completely shut down windows and restart it.
c. Beyond that, you can shut down windows, power down the computer, then restart.
d. There's more. Computers never really power down. The next step is to unplug the computer if it is a desktop. If it is a laptop, remove the battery for a few minutes.

The reason for these progressively extreme measures is that a modern Windows computer is a blend of hundreds of programs that all need to work cooperatively for it to operate. Any of these can load improperly or load in the wrong sequence, causing unpredictable behavior. When in doubt, power down the computer and remove the power source. This will often correct very difficult to solve problems.

8. The next control to the right of the BioEra icons is a dropdown control to set the play mode of the DVD.
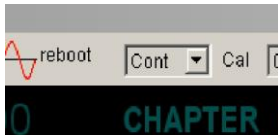
The default is "Cont" which stands for "continuous". The design starts out in this mode. After a 5 minute baseline it should be changed to the alternate setting which is "Auto". Auto activates the autothreshold function.

In the "Auto" setting, the autothreshold will continually adjust itself relative to the pIR signal. When the signal is less than the threshold level, the movie will pause and a vertical bargraph will appear. To restart the movie, the bargraph must be increased to cross the yellow horizontal line. Raising the bar requires intense concentration but simultaneously with emotional relaxation. Even small amounts of frustration will produce a signal drop which will be seen on the bargraph.
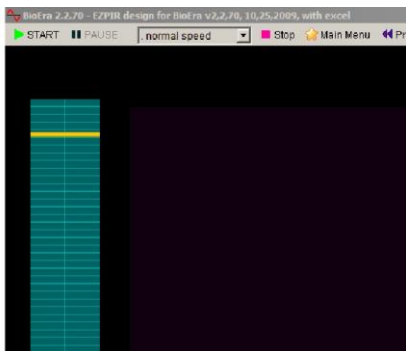
10. To the right of the "Cont/Auto" dropdown is a dropdown called "thr/sig". This stands "threshold/signal". The function of this control is to determine the behavior of the autothreshold relative to the signal level. The pIR signal has a 2:1 priority over the threshold function, so whenever the brain based signal changes it will move twice as fast as the threshold setting changes.

The default setting is "+.02". If the movie is not pausing because the person is hypervigilant, moving to higher "+" settings should help. If the person is emotionally labile and the movie is pausing too frequently, moving to the "-" settings should help. In general, you are better off matching the subject to the system by suggesting the mental state that is most reasonable for the process. This is a passive, relaxed, diffuse focus while the movie is playing. Then to turn the movie back on a shift to an active focus is required. The thr/sig adjustments can help modify the system to match the person's default mental style.

Settings that are higher than "0" are preceded with a "+". Here is an example: If the pIR signal were to remain constant at 90.00 and the dropdown is set to +.1, the autothreshold will set itself to 90.10. At the point where the threshold exceeds the signal, the movie will pause. The maximum length of time for this to happen will be 3 minutes assuming a stable signal. It can be longer if the signal is continuously changing. With this setting, people who are hypervigilant and produce a continuously increasing signal can still be challenged by the system. To turn the movie back on the person would have to raise the signal above 90.10 by increasing brain activity in the prefrontal cortex. If the person is not able to increase the signal, the movie will not turn back on.

Settings that are lower than "0" are preceded with a "-". Here is an example: If the pIR signal were to remain constant at 90.00 and the dropdown is set to -.1, the autothreshold will set itself to 89.90. In this condition, the movie will continue to play until the pIR signal srops to below 89.90. This will happen with a person who is able to shut down analytical thinking and allow the movie to take over his/her emotions. Under those conditions the prefrontal cortex shuts down and the signal drops. When the pIR signal drops below the threshold setting of 89.90, the movie will pause. To turn it back on, the person must raise the signal above 89.90. Note: settings in the "-" range will eventually turn the movie back on even if the person is not able to raise the pIR signal, although it may take several minutes for this to happen. Use these settings mostly for people who are emotionally fragile and need extra encouragement.

Setting this function controls the stress level of the session and determines the overall amount of mental effort expended. Excessive mental effort may result in side effects related to prefrontal cortical fatigue such as hyperactivity, headaches, etc. Somewhere between 5 to 10 pauses in a single session is reasonable, but this is only one measure. The total amount of time spent turning the movie back on may be a more significant measure, measured by the "pause time" meter.

To restart the movie the person must become completely relaxed but simultaneously concentrate intensely on the bargraph until it crosses the yellow threshold line. Each .01 degree (deg F) equivalent corresponds to 1.5 divisions on the bargraph. The term "degree equivalent" is used because the numbers that appear as the "SIG" are

arbitrary. They represent a combination of surface skin temperature and excess thermal transfer from increased brain activity through the forehead. This excess is a themal waste product given off by the brain to maintain cellular thermal stability.

11. To the right of the thr/sig control is the final control called "Cal". This stands for "calibration". This can adjust the pIR signal (SIG) level up or down. I generally like to keep the signal somewhere around 90 so that people don't think they are changing brain temperature. However this is a very arbitrary measure. It can be set wherever you would like it. It is really only measuring a thermal waste product from the prefrontal cortex. As such the more meaningful number is the "+/- baseline" number. They can both be seen here:

12. The numbers on the above screen reflect important system functions.

   a. SIG. As explained above this is the pIR signal. Changes in the signal represent thermal waste from the prefrontal cortex. The actual number is not meaningful.

   b. +/- baseline. This is not visible for the first 5 minutes of the session. When 5 minutes has elapsed, the word "+/- baseline" the associated numbers will appear. This is the baseline signal expressed as "0.00". From that point on in the session, the number will change up or down to reflect change from the baseline of 0.00. Note: if the signal starts to drop below 0.00, it probably means that fatigue has set in and the session should be discontinued.

   c. THR. This stands for "threshold". It shows the actual level of the changing threshold.

   d. CHAPTER. DVD movies are arranged into chapters. These chapters are numbered. Depending on the length of the chapters, a movie might have anywhere from 10 to 60 chapters. It is useful to record the chapter number at the end of the session so you can start the next session at the same chapter in the movie.

   e. ELAPSED TIME. This is in the format of MM:SS. This counts the elapsed time starting from when the "Start" button is pressed. A working time measure may be added in the future. For now it should be tracked in your notes based on the time of the first movie pause. The first session or two should be limited to 10 or 15 minutes of working time, eventually working up to a maximum of 30 minutes. This should be tailored to individual fatigue response patterns. Note: since the seconds continually tic off, it can also be a way to check if the design is still running or if it has frozen.

   f. PAUSE TIME. This is in the format of MM:SS. This counts the cumulative time the movie has been paused. It is a measure of total mental effort. It can be used to sense when the person is starting to fatigue. People new to the system may fatigue after only 2 or 3 minutes. Most can eventually build to 12 to 15 minutes. Longer times seem to correlate with increased emotional resilience.

RUNNING A SESSION

1. Start with a 5 minute baseline with the movie in CONTINUOUS PLAY mode (Cont). During this time the optimal mental state is represented by a passive focus. The person should allow himself/herself to get drawn into the movie, letting the movie director take over the limbic system. When this happens, the prefrontal cortex becomes less active.

   He/she should refrain from analyzing the plot of the movie, analyzing the processing of the software, or similar mental behaviors. These represent increased activity of the prefrontal cortex and will interfere with limbic activation. Limbic activity and prefrontal cortical activity represent mutually incompatible responses and will interfere with each other.

2. After 5 minutes, switch from "CONTINUOUS PLAY" to "AUTO THRESHOLD" (Auto). When you do that, the threshold will start to move in the direction of the current signal (SIG) level.

3. When the SIG drops below the threshold, or the threshold moves above the SIG, the movie will pause. The ideal situation is for the movie to pause when the SIG drops below the threshold. This creates a negative consequence for whatever the brain did just prior to that, which is to shut down the prefrontal cortex and activate the limbic system.

4. To turn the movie back on, the person must reverse this process. The movie will turn back on when the SIG exceeds the threshold. This reinforces what the brain did just prior to that, which is to quiet the limbic system and activate the prefrontal cortex.

5. As a consequence of this process, two things happen.

   a. One is that the person is forced into flipping back and forth between two incompatible brain states. One aspect of most types of mental pathology is responding to most stimuli with the same pattern rather than flexibly choosing the response to meet situational demands. Requiring the person to change between the two types of focus helps introduce response flexibility.

   b. The second thing is that there are many repetitions of actively exercising the prefrontal cortex. This is seen as surges of increased thermal output as monitored on the SIG meter in the runtime screen. These repetitions will produce mental fatigue. The first session should be limited to 10 or 15 minutes of working time (time beyond the first pause) to avoid inducing too much frontal fatigue. It is also preferable to do the first few sessions in the morning to avoid introducing sleep onset problems. After the first few sessions, this effect is rarely noticed so they may be conducted at any time of day. Sessions can be lengthened to as long as 30 minutes of working time, but that seems to be the point at which most people will begin to fatigue even if the brain is functioning very efficiently. Fatigue can be noted by increased difficulty turning the movie back on, and/or larger and more frequent signal drops below the threshold.

      The fatigue is typically described by people as feeling mentally tired, and sometimes includes a feeling of vague discomfort in the front of the head. Sometimes there is a mild throbbing sensation. If any of these things are noticed, the session should be stopped, as no further progress will be achieved in that session. The other reason for stopping is that if the person is too fatigued mentally, a state of disinhibition may occur for the balance of the day.

      Disinhibition may present as different symptoms depending on the person. A hyperactive child may become more hyperactive. A migraine sufferer may get a

headache later that day. It is best to keep the sessions short enough and gentle enough to reduce or prevent excess prefrontal cortical fatigue. Note: after the person gets a good night's sleep, the next day usually represents much better than normal functioning.

Typically I limit session frequency to once per week and limit total working time to 30 minutes. More frequent sessions may be attempted but may not be useful. Sessions that are too frequent don't seem to allow for rest and recovery before the next session.

6. When a session ends, close out the program. Restart it for the next session. This ensures that all the program elements will be completely initialized for the new session, and that the program will correctly recognize the new DVD.

7. Behaviors that are not typically self-monitored can make good change measures. These include but are not limited to the following:

   a. Clarity of articulation. Speech can be recorded, pre/post. Clarity usually improves.
   b. Fluency of ideas. The expression of ideas usually becomes more fluid.
   c. Squirming in the chair as "squirms per minute". The rate reduces.
   d. Headache intensity. Migraines may seem to disappear entirely. They really don't, but become soft enough to be difficult to identify. Tension-type headaches tend to reduce in intensity, but because they are closely tied to emotions, they are less predictable.
   e. Intensity and frequency of intrusive background thoughts (mental multi-tasking). There is usually a perceived decrease in the intrusiveness of these thoughts.
   f. Blink rate (slower correlates with relaxed focus, faster correlates with anxiety). Blink rate usually reduces.
   g. Skin conductance usually decreases and has fewer shifts per minute.
   h. Surface EMG usually decreases, especially from tension related muscle groups.
   i. Finger temperature usually increases, but in a manner different from direct finger temperature training. The change is very sudden and large. It occurs at the same time the other variables normalize, so it is a nice physiological variable to monitor.
   j. EEG typically shows a decrease in slower frequencies frontally, and may show increased beta.

8. Typically, changes in these relatively non self-monitored behaviors occur after the first 10 or 15 minutes of the session. This period of improved brain/behavior stability may last for a day or two or three but typically fades somewhat after that, back towards baseline. Each session tends to produce an effect that lasts for longer period of time.

SELECTING APPROPRIATE MOVIES

Movies should resonate specifically with the person working on the EZPIR system. It is important that the movie director be able to bypass the analytical thinking of the prefrontal cortex and directly take over the limbic system. This will require different types of movies for different people.

With adults it is useful to select a movie that resonates emotionally but also has not already been viewed. Sometimes a movie will work if it has been watched before but the effect may not be as strong.

Children relate to movies differently. Younger children will often be as enthralled and captivated by a movie that they have already watched 40 or 50 times. I often have them bring in their favorite movie and it works well.

Movies act a bit like a live projective test. Scenes that tug strongly at the emotions will often cause the movie to pause. Clinically it may be useful to make note of these events.

I would very much appreciate any and all feedback as to your experiences using this system.

Jeffrey A. Carmen
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