

Experiment HP-28: Control of EEG and Biofeedback Lab/Research Study

Equipment Required

PC or Mac Computer

IXTA, USB cable and power supply

iWire-B3G cable and EEG leads

Reusable Gold-Cup EEG Electrodes

EEG Gel

Elastic headband

Alcohol swabs

NOTE – If doing this experiment as a competition – plug a 2nd iWire-B3G into the iWire-2 port on the front of the TA unit. Set the 2nd subject up in the same manner as stated below.

Start the Software

1. Click on LabScribe
2. Click Settings → Human Psychophysiology → ControlBiofeedback-EEG
3. Once the settings file has been loaded, click the **Experiment** button on the toolbar to open any of the following documents:
 - Appendix
 - Background
 - Labs
 - Setup (opens automatically)

EEG Cable Setup

1. Locate the iWire-B3G cable and reusable electrode lead wires ([Figure HP-28-S1](#)) in the iWorx kit.
2. Insert the connector on the end of the cable into the iWire-1 input on the front of the IXTA ([Figure HP-28-S3](#)).
3. Repeat the procedure for the 2nd iWire-B3G.
4. Use alcohol swabs to clean the skin where the electrodes will be placed. Five electrodes will be placed on the head:
 - one is high on the forehead as close to the hairline as possible, to the left and right of the center line over each eyebrow
 - one about two inches above each ear, on the left and right temporal lobes.
 - the ground will be on the back of the neck, just off center.



Figure HP-28-S1: Reusable gold cup electrodes. It is recommended that these be used for this lab.



Figure HP-28-S2: The iWire-B3G cable.

Note: Connect the iWire-B3G to the IXTA prior to turning it on.

5. Place an elastic headband around the subject's head to hold the electrodes in place. The headband should be placed as high over the ear as possible. The headband should be tight enough so that it does not slide up or down, but not so tight that it is uncomfortable.
 - Place a dab of the tacky conductive gel on each recording electrode before it is placed on the proper location.
 - Place each recording electrode in the proper location ([Figure HP-28-S3](#)).
 1. The lead from the electrode over the left eyebrow on the frontal lobe is connected to the red or +1 input.
 2. The lead from the electrode over the left ear (temporal lobe area) is connected to the black or -1 input.

3. The lead from the electrode over the right eyebrow on the frontal lobe is connected to the white or +2 input.
4. The lead from the electrode over the right ear (temporal lobe area) is connected to the brown or -2 input.
5. The lead from the ground electrode on the neck is connected to the green input.



Figure HP-28-S3: The iWire-B3G cable connected to an iWorx TA. This image shows snap leads, you will be using the reusable EEG electrodes.

7. The lead wires should not hang down in the person's eyes. Drape the leads for the electrodes over the subject's shoulder or the back of the head. There should be no tension on the electrodes.
8. The subject should sit quietly with their hands in their lap.

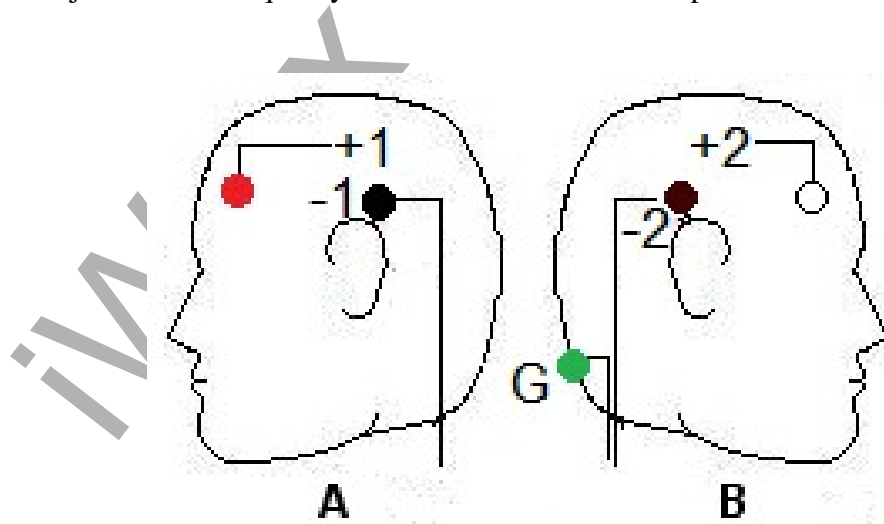
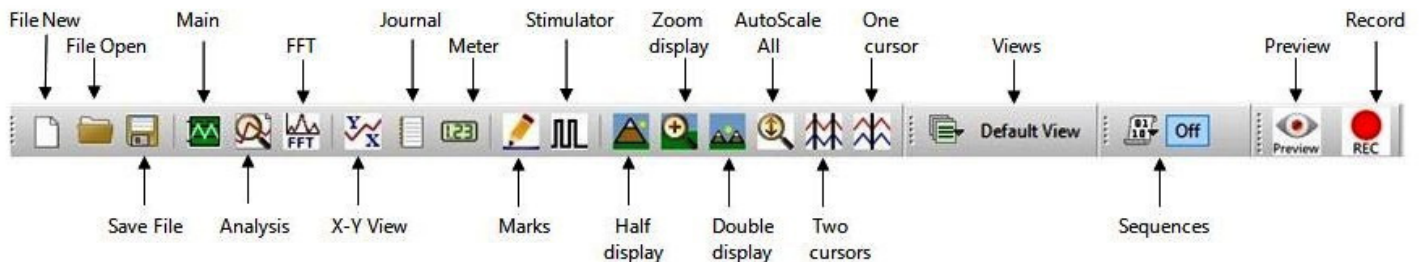


Figure HP-28-S4: The positions of the electrodes used to record the EEG from a subject.

Exercise HP-28: Control of EEG and Biofeedback Lab/Research Study

Directions:

1. Before starting the training, participants should be told that biofeedback training involves modifying the activity of their brain, and that they should try to remain calm and meditate for a full 5 minutes.
2. Remove all jewelry and metal objects from the subject's head.
3. The subject should be sitting facing the computer monitor.



Run the Experiment:

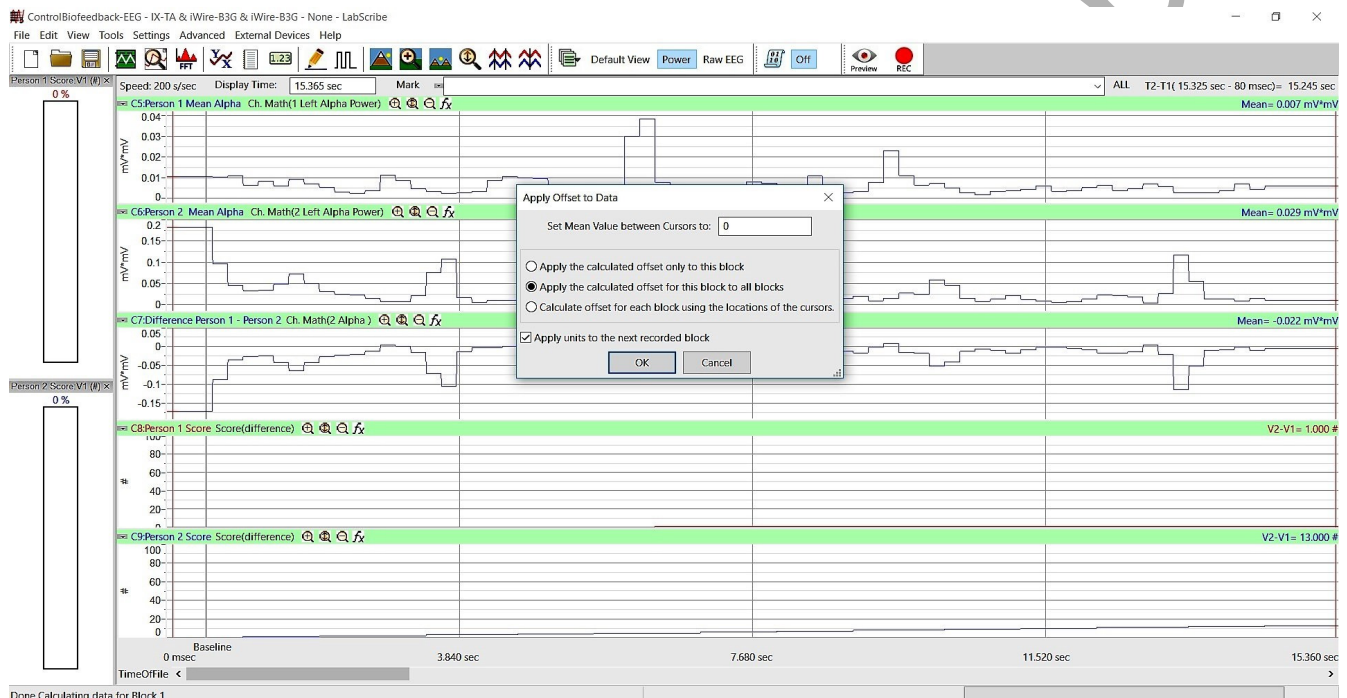
Checking the EEG Leads

1. For this section of data collection, record in “Raw EEG” view
 - Click Raw EEG in the view menu on the tool bar.
 - Click Record to determine that the electrodes are making a good connection to the scalp and the recording from the subject(s) looks good and without electrical noise.
 - Click Stop.
2. Click File → SaveAs to save your data.

Baseline Data:

1. For this section of data collection, record in “Power” view
 - Click Power in the view menu on the tool bar.
2. Record for 1 minute then click Stop.
3. Click File → Save to save your data.
4. Double the display time by clicking the “Double display” icon so that the full 1 minute of data are on screen.
5. Move your cursors so that they are on each side of the full recording of baseline.

6. Right click in the top Channel C5 – Person 1
 - Click Units → Set Offset
 - Set the offset to “0”
 - Click the 2nd radio button as shown in the image below, click OK.
 - Repeat the procedure for Channel C6 – Person 2
7. This will set the baseline.



Experimental Data:

NOTE – It is important that you do NOT click the AutoScale All button when doing this section of recording. The score will not be calculated correctly.

- If the recording is accidentally AutoScaled, reset the scale for the two Score channels
 - Right click in the Score channel
 - Click Scale → Set Scale → Max 100, Min 0 → Click OK
 - Repeat for the 2nd Score channel
1. Remind your subjects that they should try to meditate and keep calm during this section of recording. They can use imagery, mindfulness meditation or other meditative techniques to keep themselves in a calm, relaxed state.
 2. Once your subject are ready, click Record to begin recording data.

- Record for at least 5 minutes then click Stop.
- Click File → Save to save your data.



Data Analysis:

- Double the display time, if needed, to show the full 5 minutes of data on screen.
- Move one cursor to the start of the session and one cursor to the end of the session as shown above.
- Look at the Meter or the Score channel, and note the subject's score for this session.
- This value is the percentage of time the subject was able to keep their brain waves in a calm state of relation during the 5 minute meditation.

Questions:

- Was your subjects able to control their brain waves and keep themselves calm?
- Did you see an increase in score as time went on? Look at 1 minute intervals to answer this question.
 - If there was an increase in the score, what could be the reasons?
 - If there was no increase, explain.

3. Ask the subject to verbalize what they were doing during the experiment. If they noticed their score not changing, were they able to alter their state of mind to control their stress levels?
4. Do you think it is easier or harder when competing with another person?

iWorx Sample Lab