Experiment HP-28: Sports Psychology – Music and EEG

Equipment Required

PC or Mac Computer

IXTA, USB cable and power supply

A-HB-iWire Headband and EEG snap leads

OR – SC-5 Headstrap with built-in cup electrodes

Alcohol swabs

PT-104 Pulse sensor

EEG Cable Setup

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

1. Locate the iWire Headband and EEG lead wire or the SC-5 Headstrap with built-in cup electrodes in the iWorx kit.

Figure HP-1-S1: The iWire Headband with five snap leads (left) and the SC-5 Headstrap (right).

2. If you are using the A-HB-iWire headband ~ snap the leads on the iWire Headband as shown in the image below.

   In the configuration shown,

   - Ground is in the middle,
   - Channel 1 (Red and Black) will record the left EEG
   - Channel 2 (White and Brown) will record the right EEG

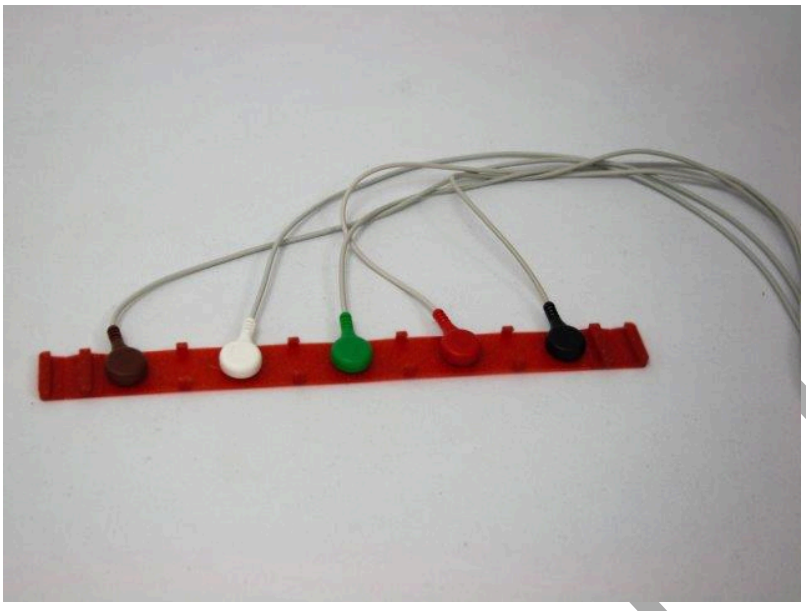
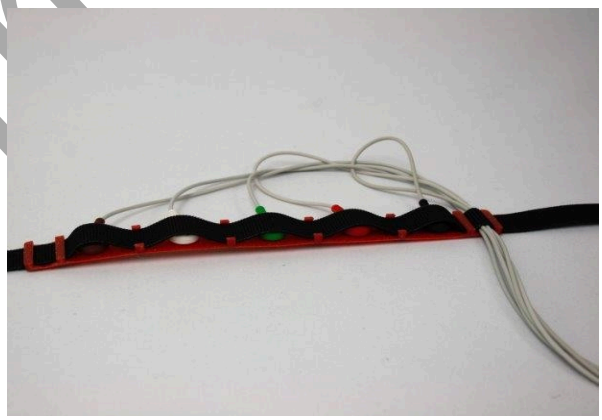


Figure HP-28-S2: The iWire Headband with five snap leads connected.

Insert the Velcro strap such that the soft side is facing down.

Keep some excess length between the 2 tabs on the right side as shown in the image below and snake the electrode wires through it.



Tighten the velcro to hold the leads in place.

3. Braid the wires before plugging them into the iWire box to reduce the noise.
4. For both the iWire headband leads and the SC-5 headstrap with built-in leads:
    - Place a small amount of electrode gel on the electrodes.
    - Place the headband on the head such that the green electrode is at the center of the forehead.
    - Make sure that all electrodes are making contact with the skin.

5. Use alcohol swabs to clean the skin where the electrodes will be placed.

Select one person from your group to be the subject in this experiment.

6. Place the PT-104 pulse sensor on the volar surface (where the fingerprints are located) of the distal segment of the subject's middle finger or thumb, and wrap the Velcro strap around the end of the finger to attach the unit firmly in place.
    - Make sure the sensor is not too tight or too loose.
    - If it is too tight, there will be no blood flow and the pressure will not be picked up by the sensor; if it is too loose, the flow will not be detected.

Experiment HP-28: Sports Psychology – Music and EEG

Exercise 1: EEG while Resting

Aim: To learn how to record an EEG and Heart Rate while resting and become familiar the EEG waveform.

Approximate Time: 20 minutes

Procedure

1. Ask the subject to sit quietly and not move unless told to do so, and to keep their eyes open during this phase of the experiment.
2. Click on the Record button.
3. Click on the AutoScale All button. Your recording should look like the Figure HP-28-L1 below.
4. Type the **Resting EEG** in the Mark box. Click the mark button to attach the comment to the data. Continue recording.
5. Record data while the subject is in a relaxed state for approximately 5 minutes.
6. Click Stop to halt recording.
7. Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.

Data Analysis

1. Scroll through the data recorded in this exercise and find an artifact-free section of data recorded while the subject was resting. Ideally, you want to be looking at a minimum of 1 to 2 minutes of data.
2. Use the Display Time icons in the LabScribe toolbar to adjust the Display Time of the Main window to show a one minute artifact-free section of data on the Main window. This section of data can also be selected by:
    - Placing the cursors on either side of a one to two minute section of data.
    - Clicking the Zoom between Cursors button on the LabScribe toolbar to expand the period to the width of the Main window.

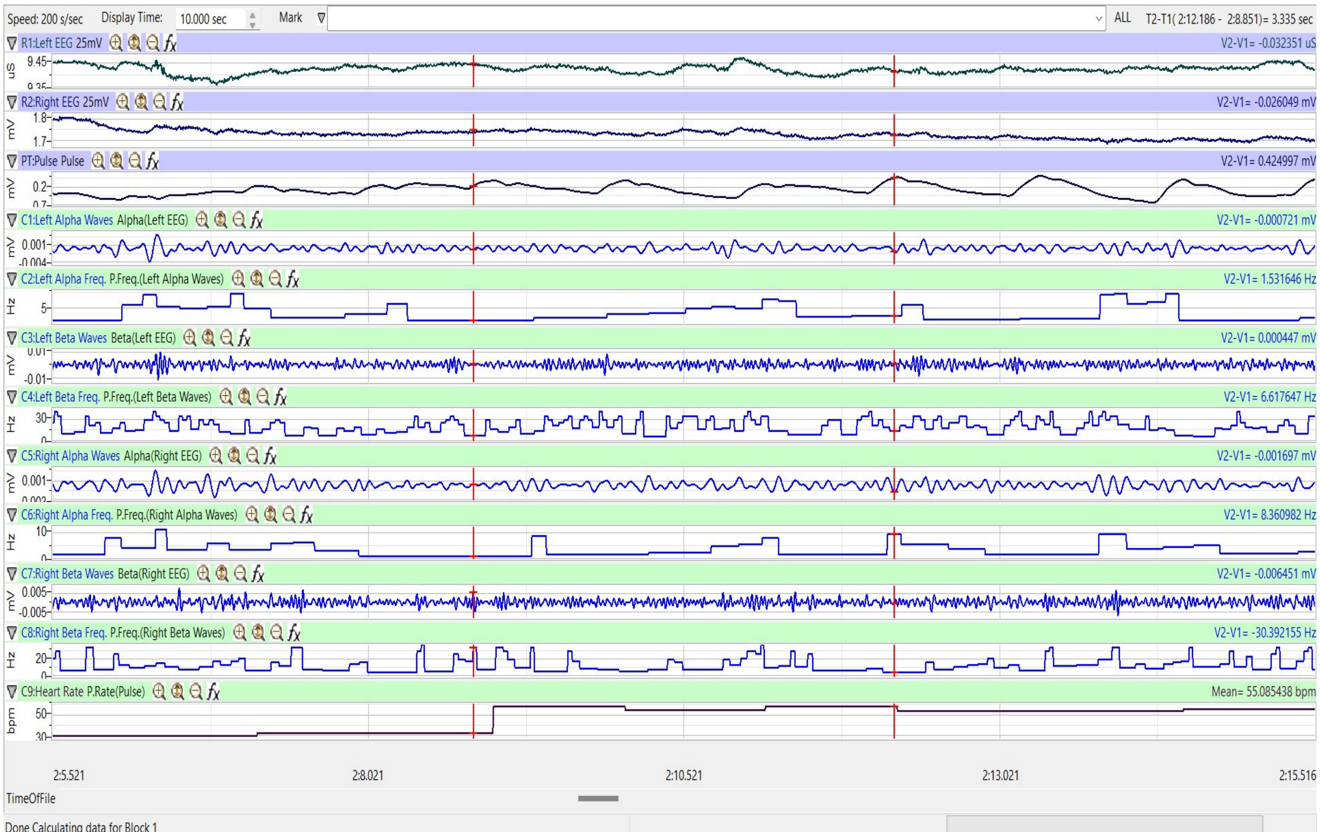


Figure HP-28-L1: Recording of EEG from the left and right temporal regions of the brain displayed on the Main window. The complete EEG signals are displayed in the two uppermost channels. The Alpha and Beta waves derived from the complete EEG signals and the frequencies of those waves from each temporal region are displayed on the lower channels

3. Click on the Analysis window icon.
4. Look at the Function Table that is above the uppermost channel displayed in the Analysis window. The names of the mathematical function used in the analysis, Max-Min and Mean appears in this table. The values for Max-Min and Mean on each channel are seen in the table across the top margin of that channel.

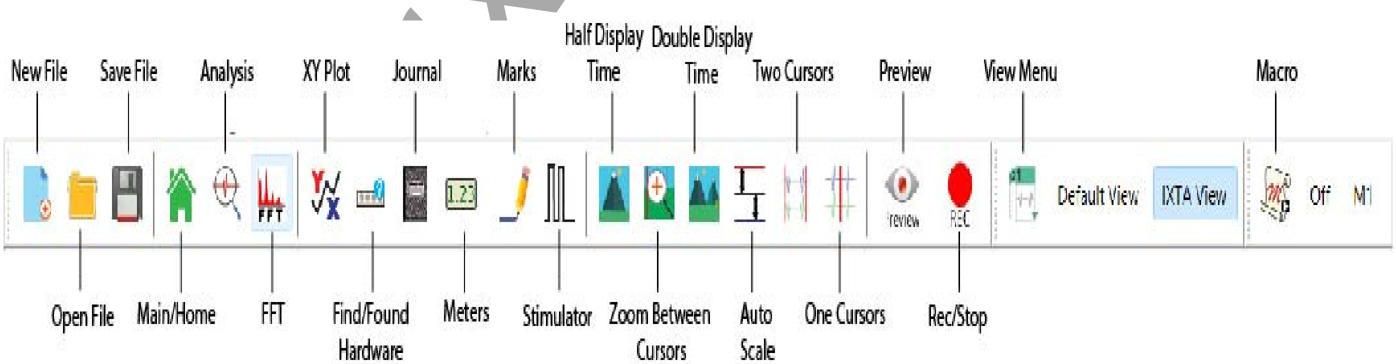


Figure HP-28-L2: The LabScribe toolbar.

5. Use the mouse to click on and drag a cursor to each margin of the data displayed on the Analysis window. The values for the following parameters should be recorded:
    - The differences between the maximum and minimum wave amplitudes (Max-Min) of the waves displayed on the Left Alpha, Left Beta, Right Alpha, and Right Beta Wave channels.
    - The mean frequency (Mean) of the waves displayed on the Left Alpha, Left Beta, Right Alpha, and Right Beta Frequency channels.
    - The mean heart rate (Mean) of the Heart Rate channel will generate the subject's average heart rate while resting.
6. Once the cursors are placed in the correct positions for determining the difference between the maximum and minimum amplitudes and the mean frequency of the waves in a one minute section of data, the values of these parameters can be recorded in the on-line notebook of LabScribe by typing their names and values directly into the Journal, and on Table 1.

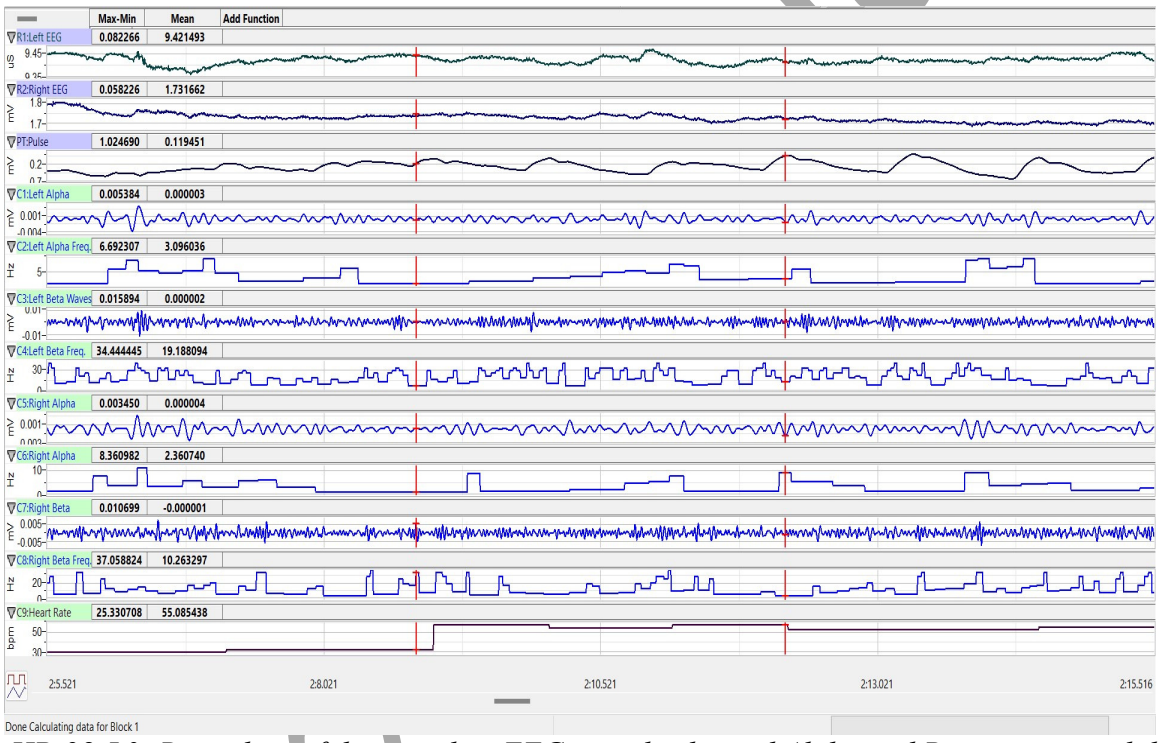


Figure HP-28-L3: Recording of the complete EEG signals, derived Alpha and Beta waves, and the wave frequencies displayed in the Analysis window.

7. The functions in the channel pull-down menus of the Analysis window can also be used to enter the names and values of the means into the Journal. To use these functions:
    - Place the cursors at the locations used to measure the values for the parameters of the EEG waves in the selected region of data.

- Transfer the name of the mathematical function used to determine the values of the parameters to the Journal using the Add Title to Journal function in the pull-down menu of any channel.
- Transfer the values of the parameters of the EEG waves to the Journal using the Add Ch. Data to Journal function in the Left EEG Channel pull-down menu.

8. Select Save in the File menu.

Table HP-28-L1: EEG Frequencies & Amplitudes and Heart Rate – Resting and After Music

	RESTING		AFTER MUSIC	
	Max-Min Amplitude (mV)	Mean Frequency (Hz)	Max-Min Amplitude (mV)	Mean Frequency (Hz)
Left Alpha Waves				
Left Beta Waves				
Right Alpha Waves				
Right Beta Waves				
Mean Heart Rate				

Exercise 2: The "Fight Song"

Aim: To determine if listening to a "fight song" will alter the subject's EEG or heart rate indicating arousal.

Approximate Time: 20 minutes

Procedure

1. Before beginning this exercise, inform the subject of the experimental conditions:
   - The subject should sit quietly with eyes closed throughout the recording period.
   - Let the subject know they will be listening to one or two songs that represent the "fight song" mentality.

- Encourage the subject to "get into the zone" and enjoy listening for a few minutes.

2. Type **Music** in the Mark box. Click on the Record button. Click the mark button.
3. Start the music for the subject. It is best to use headphones.
4. Click on the AutoScale All button. Continue recording while the subject is sitting quietly with their eyes closed. Record until the songs have ended.
5. Click Stop to halt recording.
6. Select Save in the File menu.

Data Analysis

1. Scroll through the recording and find the section of data that was recorded while the subject was listening to music
2. Repeat the analysis as explained for Exercise 1 and place the data in Table 1.

Questions

1. What hemisphere has a higher level of Alpha wave activity during Rest? While listening to the music?
2. What hemisphere has a higher level of Beta wave activity during Rest? While listening to the music?
3. What was the subject's heart rate at rest? While listening to the music?
4. Do these results demonstrate that the subject had an increased state of arousal when he or she was listening to music? Give the reasoning.
5. Do these results demonstrate one hemisphere had a higher state of arousal than the other? Give the reasoning.