Experiment HP-14: Hypothesis-driven Biofeedback Lab/Research Study

Equipment Required

PC or Mac Computer

IXTA, USB cable, power supply

*GSR electrodes

*ROAM ECG electrodes

*PPG-320 Pulse plethysmograph

*TM-100 Temperature sensor

*RM-220 Nasal Cannula

Note: adding or removing sensors for this experiment is left open-ended. As many parameters as the hypothesis is looking at can be measured.

Extra items such as: blankets, a variety of feeling producing images, ice packs, paper bags, etc... may be needed depending on the hypothesis.

Sensor Setup – these are all optional

1. Locate the PPG-320 pulse plethysmograph and plug it into the PT port on the front of the TA.
    - Place the pulse sensor on the subject's thumb or finger.
2. Locate the GSR electrodes. Plug them into channel A7.
    - **Note – the GSR unit is pre-calibrated. No other calibration is needed.**
    - Moisten them with GSR conductive paste. Attach the GSR electrodes to the pointer and ring finger of the subject's hand. Make sure the fingers are not too cold or too dry.
3. Remove the ROAM from the dock and place the electrodes as shown.

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Figure HP-14-S1: PPG pulse plethysmograph, GSR and nasal cannula.

4. Locate the RM-220 nasal cannula and plug the connector into channel A1 on the front of the IXTA unit.
    - If the subjects are sitting during these exercises, they should sit erect so that the muscles involved in pulmonary ventilation are able to move with few restrictions.
    - Stop the experiment if the subject feels dizzy or nauseated.

iWorx Sample

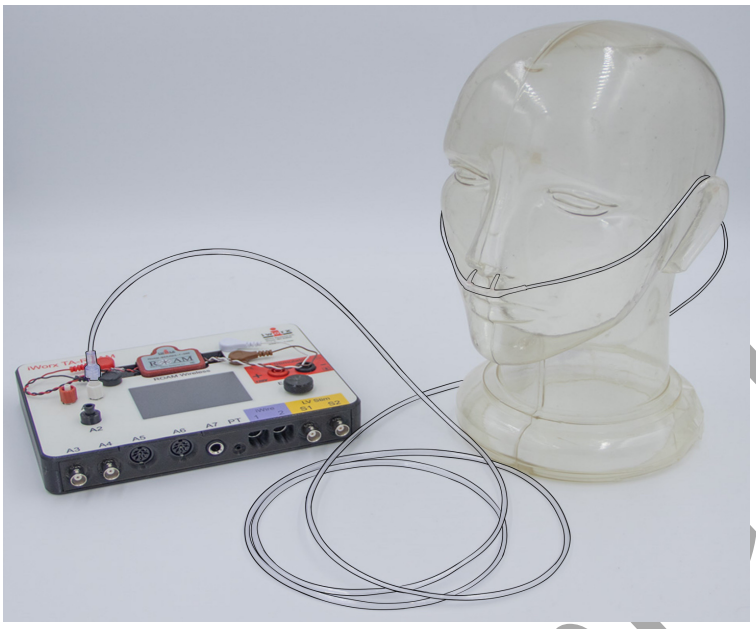

Figure HP-14-S3: Nasal cannula connected to the TA showing the proper positioning on the face.

NOTE: If using the optional RM-204 respiration belt instead of the nasal cannula:

- Plug the RM-204 into channel A6 on the front of the IX-TA
- Click Edit → Preferences
  - Uncheck channel A1 – Respiration AND channel C2 – Breathing Rate
  - Place a check mark in channel A6 – name it Respiration by typing in the box
  - Click OK
- To create a new Breathing Rate channel, on the new Respiration channel
  - Click Fx → Periodic → Rate → OK
  - Click on the title of the new channel and rename it – Breathing Rate
  - Click on V2-V1 on the right hand side of the channel and change to Mean

iWorx Sample Lab

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This lab is meant to be a "hypothesis-driven" lab where students will come up with a technique or techniques they would like their subject to try in order to alter some aspect of the subject's physiological parameters. This can include: reducing heart rate, changing skin conductance, altering body temperature and/or breathing rate. The settings file for this lab is currently set up to record: ECG, Pulse, Skin Conductance, Blood Pressure, Respiration, Body Temperature, Heart Rate and Breathing Rate. Parameters can be added or removed based on what the goal of the hypothesis is.

Sample Exercise: Measuring Galvanic Skin Response and Body Temperature Before and After Imagery

Aim: To measure the subject's skin conductance and body temperature before and after looking at "cold" feeling/producing imagery.

Approximate Time: 30 minutes or more

Procedure

1. The subject should rest their hand with the sensors attached comfortably. The GSR electrodes should be free from any extraneous pressure and the electrode cable should be hanging freely. Instruct the subject not to move the hand during the recording process; movement may introduce artifacts into the recording.
2. Click on the Record button. Type the **subject's name** in the Mark box and click the mark button. Since the GSR amplifier is already calibrated, the value displayed on the Skin Conductance Level channel is the baseline skin conductance level (SCL) of the subject. Record the subject's baseline SCL for approximately one minute until the recording stabilizes.
3. Click Stop to halt the recording.
4. Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.
5. Wrap the subject in a warm blanket and let the subject sit and get "warm." Ask the subject when they begin to feel a bit "sweaty." Do not allow the subject to get uncomfortable.

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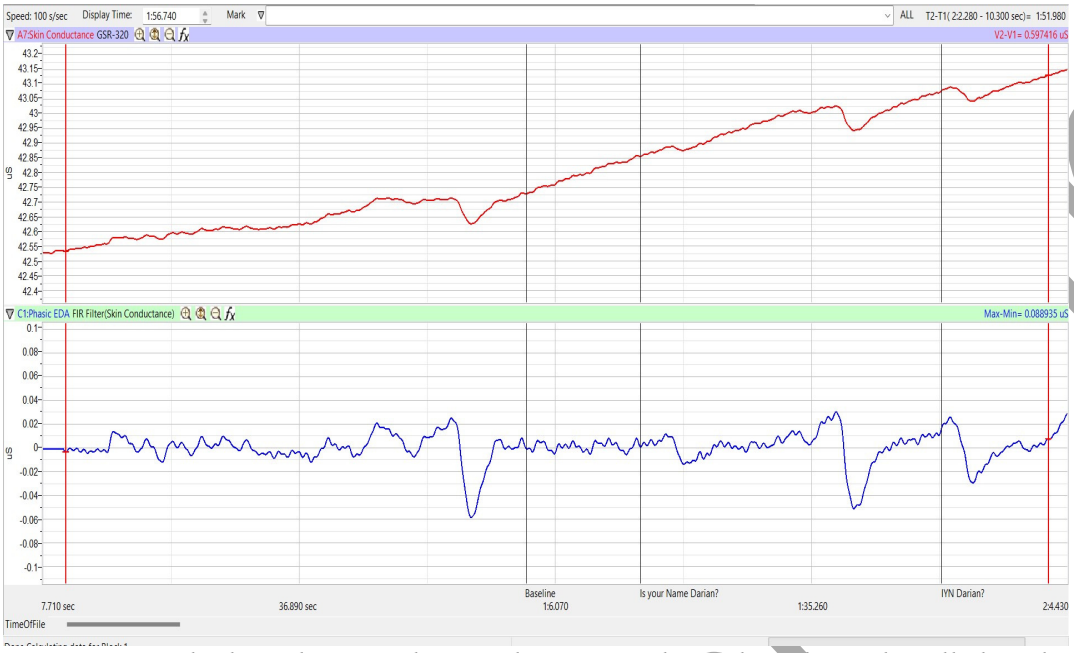

Figure HP-14-L1: Sample data showing skin conductance only. Other channels will show based on the hypothesis and settings chosen for the lab/research project.

9. Click on the Record button. Record the subject's baseline "warmed" skin temperature for one minute.
10. Continue recording.
11. Begin showing your subject images of "cold" feeling/producing images. These images can be imported and built into the ***"Macros"*** option under ***Edit => Preferences***. Refer to the iWorx ***Help*** manual for more information.
12. Show each image for approximately 5 seconds. Have the subject concentrate on each image, while thinking "cooling" thoughts and that their body temperature is decreasing.
13. Continue recording until you see a noticeable change in skin conductance and/or body temperature. Record no longer than 30 minutes.

Note: If, <u>at any time</u>, the subject gets uncomfortable being wrapped in the blanket, remove the blanket and stop the experiment.

14. Click on the Save button to save the data file.
15. Repeat this exercise on other subjects in your lab group.

Data Analysis

1. Scroll through the data file and locate the recording of the subject's baseline skin conductance level (SCL).
2. Use the Display Time icons to adjust the Display Time of the Main window to display the one minute recording of the subject's baseline SCL on the Main window. This section of data can

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also be selected by:

- Placing the cursors on either side of the one minute recording of the subject's SCL, and
- Clicking the Zoom between Cursors button on the LabScribe toolbar to expand or contract the one minute recording to the width of the Main window.

3. On the right hand margin of the Skin Conductance channel, the mathematical function, V2-V1, T2-T1, and Mean appear. The value for mean baseline skin conductance level is displayed here. On the right hand margin of the Temperature channel, the mathematical function, Mean, should appear. The value for mean "warmed" body temperature is displayed here.

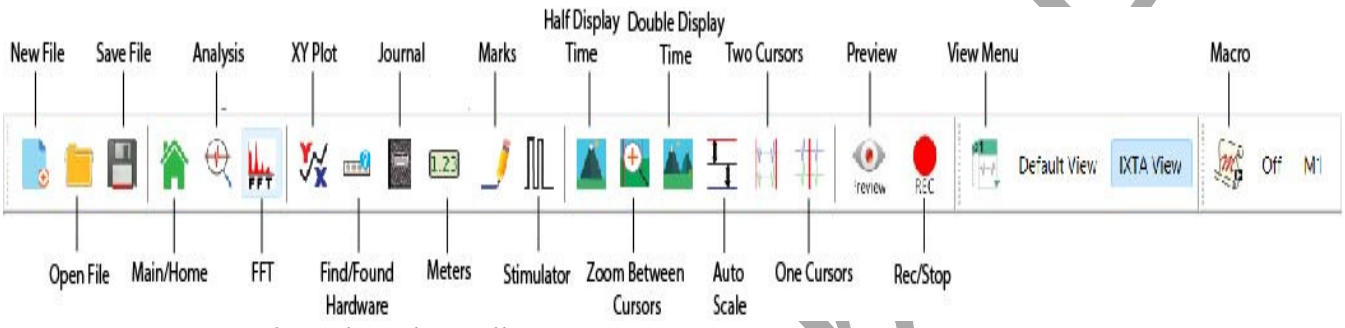

Figure HP-14-L2: The LabScribe toolbar.

4. Move the cursors to the section of data where the subject's "warmed" body temperature was recorded. Position the cursors to have at least 30 seconds of data on screen.
5. Once the cursors are placed in the correct positions for determining the mean baseline skin conductance level in the one minute recording, the value for the mean baseline skin conductance level can be recorded in the on-line notebook of LabScribe by typing the name and value of the parameter directly into the Journal.
6. Scroll through the data file and locate the recording when the subject was shown images of "cold" feeling/producing images.
7. Use the Display Time icons to adjust the Display Time of the Main window to display a five minute section of an area near the end of the imagery recording. This section of data can also be selected by the methods mentioned above.
8. Place the cursors as stated using the information in step 5. Enter the value for the mean "cooled" skin conductance level and body temperature for the subject in Table 1.
9. If other data, such as Pulse and Heart Rate are being recorded, the data can be selected and analyzed in the same way.

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Table HP-14-L1: Baseline SCL & Temperature vs. SCL & Temperature after Imagery

Subject's Name	Mean Baseline SCL (µS)	Mean "warmed" body temperature (degrees C)	Mean "cooled" SCL (µS)	Mean "cooled" body temperature (degrees C)

Figure HP-14-L3: Sample data showing pulse, respiration, heart rate and breathing rate.

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