Experiment HP-24: Myth Busters – Hypothesis Testing

Equipment Required

PC or Mac Computer

IXTA, USB cable, power supply

*C-GSR-320 amplifier and 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.

As an example – the ROAM electrodes can be removed if ECG is not being recorded.

Extra items such as: Aromatherapy oils, Himalayan salt lamps, Negative Ioniziers, and magnetic bracelets, etc... may be needed depending on the hypothesis.

- Select one person from your group to be the subject. Ask the subject to go to the sink, wash his or her hands with soap and water, and dry them thoroughly. Washing the hands insures that surface oils or other substances, which might lower skin conduction, are removed. *Do not use alcohol to clean the fingers, alcohol dehydrates the skin.*
- Connect the GSR electrodes as stated in the set up document.
- Connect the temperature sensor as well.
- Attach each GSR electrode to the volar surface of the distal finger segment of two non-adjacent fingers; the index and the ring fingers are the ones usually used. Attach the electrodes with the Velcro straps so that the straps are snug, but not overly tight. Rub a small amount of GSR conduction paste into the skin prior to putting on the electrodes.
- Attach the temperature sensor to the back of the subject's hand with a small piece of paper tape.

Sensor Setup

1. Locate the PPG-320 pulse sensor and plug it into the PT port. Place the pulse sensor on the subject's middle finger.
2. Locate the C-GSR-320 electrodes and plug them into the GSR port (A7).
    - **Note – the GSR unit is precalibrated. No other calibration is needed.**
    - 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. Moisten them with GSR conductive paste.

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3. Set up the ROAM to record ECG as shown.

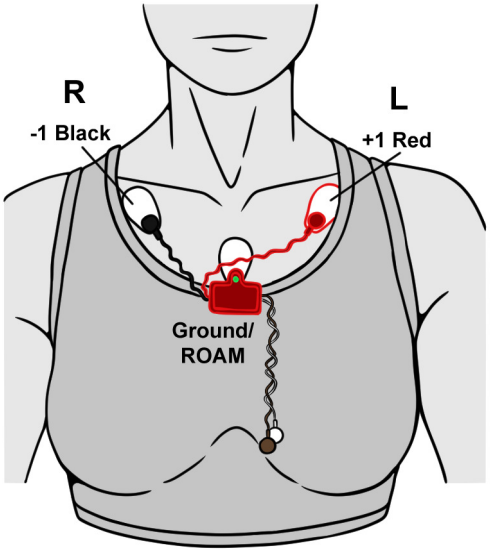

Figure HP-24-S1: Proper placement of the ECG electrodes.

Figure HP-24-S2 The pulse sensor and GSR electrodes.Temperature will be plugged into A5.

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4. Locate the RM-220 nasal cannula and plug the connector into channel A1.
    - Position the cannula so the prongs are just resting under the subject's nose, very close to the nostrils. Wrap the tubing behind the subject's ears, as shown above.
    - 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.

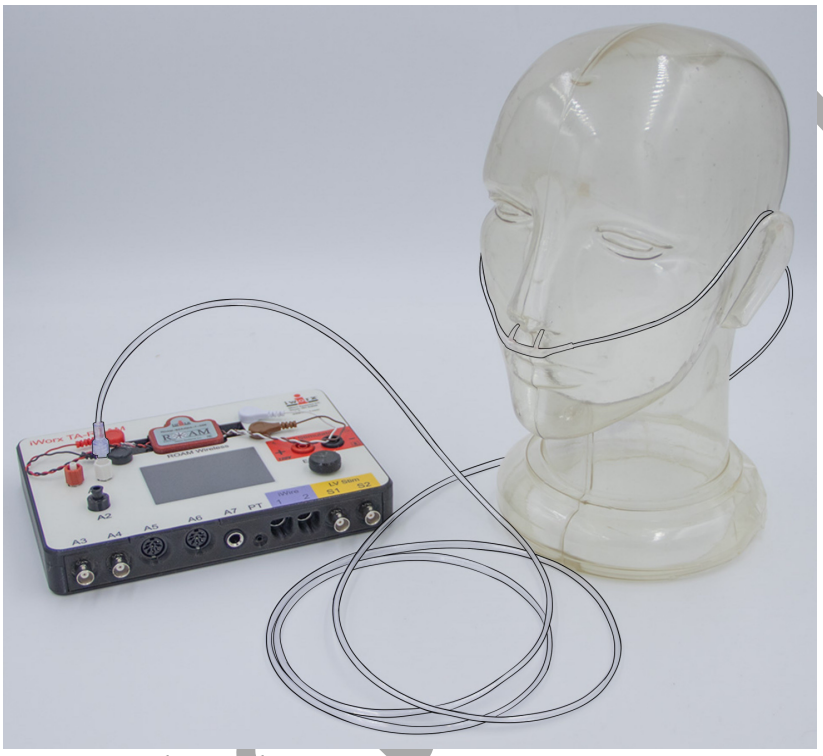

Figure HP-24-S4: RM-220 nasal cannula.

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Experiment HP-24: Myth Busters – Hypothesis Testing

This lab is meant to be a "hypothesis-driven" lab where students will design a research experiment to determine if alternative therapies such as aromatherapy, salt lamps, negative ionizers, magnetic bracelets, etc… will change stress related physiological reactions. This can include: reducing heart rate, changing skin conductance, altering body temperature and/or breathing rate, and others. The settings file for this lab is currently set up to record: ECG, Pulse, Skin Conductance, Blood Pressure, Respiration, Skin 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 Breathing Air Treated with a Negative Ionizer

Aim: To measure the subject's skin conductance and body temperature before and after breathing air treated with a negative ionizer.

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. Enter the **Baseline - 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 GSR of the subject. Record the subject's baseline information for approximately two minutes or 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.

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Figure HP-24-L1: Sample data. Other channels will show based on the hypothesis and settings chosen for the lab/research project.

10. Have the subject do a complicated set of math problems, a "Mad Minute", which can be found online. There are usually 50 problems in a set. Marth the recording **Mad Minute Start.**
11. After doing at least 1 set of these problems, measure the subject's parameters again to see if there is a change in GSR and skin temperature.
12. Click on the Record button. Type **After Mad Minute** in the Mark box and click the mark button. Record for approximately five minutes or until the recording stabilizes.
13. Click Stop and Save.
14. Turn on the negative ionizer. Have the subject sit near the negative ionizer for 1 minute. After 1 minute or so, have the subject work on a different "Mad Minute" while sitting by the running negative ionizer.
15. Click on the Record button. Type **After Negative Ionizer** in the mark box and click the mark button. Record this data for approximately five minutes or until the recording stabilizes.
16. Click Stop and Save to save the data file.
17. Open a new settings file and repeat this exercise on other subjects in your lab group.

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Data Analysis

1. Scroll through the data file and locate the recording of the subject's baseline information.
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 data on the Main window. This section of data can also be selected by:
    - Placing the cursors on either side of the one minute recording of the subject's baseline data, 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 GSR and/or skin temperature channels, the mathematical function, Mean, should appear. The value for mean GSR and/or skin temperature will appear here.

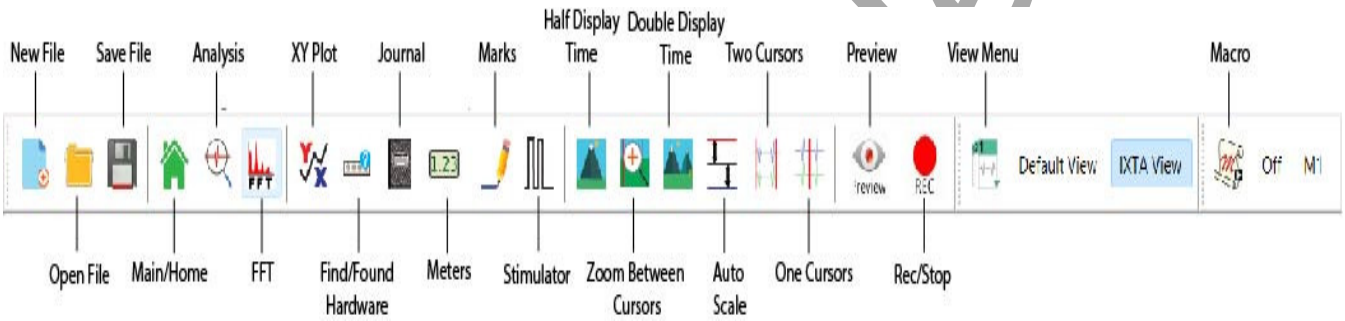

Figure HP-24-L2: The LabScribe toolbar.

4. Move the cursors to the section of data immediately after the subject worked on a "Mad Minute". Position the cursors to have at least 1 minute of data on screen.
5. Once the cursors are placed in the correct positions determine the value for the mean baseline GSR and skin temperature.
6. Repeat step 4 measuring the mean GSR and/or skin temperature for the first minute immediately after working on the problems.
7. Scroll through the data file and locate the recording when the subject was breathing the air treated by the negative ionizer. Repeat steps 4 and 5 to analyze this section of data.
8. Scroll through the data file and locate the recording after the subject worked on a "Mad Minute" while breathing the air treated by the negative ionizer. Repeat steps 4 and 5 to analyze this section of data.
9. Enter the values for the mean GSR and skin temperature for the subject in Table 1.
10. 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-24-L1: GSR and Skin Temp Before and After using a Negative Ionizer

Subject's Name	Mean Baseline GSR (µS)	Mean Baseline skin temp (deg C)	Mean GSR after "Mad Minute" (µS)	Mean skin temp after "Mad Minute" (deg C)	Mean GSR after "neg. ionizer" (µS)	Mean skin temp after "neg ionizer" (deg C)	Mean GSR after 2nd "Mad Minute" (µS)	Mean skin temp after 2nd "Mad Minute" (deg C)

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