Experiment HP-4: Skin Temperature, Stress, Calming, and Embarrassment

Exercise 1: Baseline Skin Temperature

Aim: To measure the baseline skin temperature of the subject.

Procedure

1. Select a person from your group to be the subject. Instruct the subject to sit quietly and in a position that prevents him or her from seeing the computer monitor.
2. Place the thermistor between the subject's left index and middle fingers, close to their bases. Tape the thermistor to the inside of the index finger by placing surgical tape over the wires near the tip, not over the tip. Tape the bases of the two fingers together so that the tip of the thermistor is contacting the skin on the inside of both fingers, and the tip is protected from exposure to air currents.
3. The subject should rest the hand comfortably on his or her lap for one minute before beginning the recording.
4. Type Baseline Skin Temp <Subject's Name> in the Mark box to the right of the Mark button. Click Record, click AutoScale for the Skin Temperature channel, and press the Enter key on the keyboard to mark the recording. Continue recording.
5. Type End Baseline in the Mark box. After recording the subject's skin temperature for one minute, press the Enter key on the keyboard. Click Stop to halt the recording.
6. Select Save As in the File menu, type a name for the file. Choose a destination on the computer in which to save the file, like your lab group folder). Designate the file type as *.iwxdata. Click on the Save button to save the data file.

Data Analysis

1. Scroll through the data file and locate the recording of the subject's baseline skin temperature.
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 skin temperature 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 skin temperature, and
    - Clicking the Zoom between Cursors button on the LabScribe toolbar (Figure HP-4-L1) to expand or contract the one minute recording to the width of the Main window.
3. Click on the Analysis window icon in the toolbar or select Analysis from the Windows menu to transfer the data displayed in the Main window to the Analysis window.
4. Look at the Function Table that is above the Skin Temperature channel in the Analysis window. The mathematical function, Mean, should appear in this table. The value for mean skin temperature is displayed in the table across the top margin of the Skin Conductance Level channel.

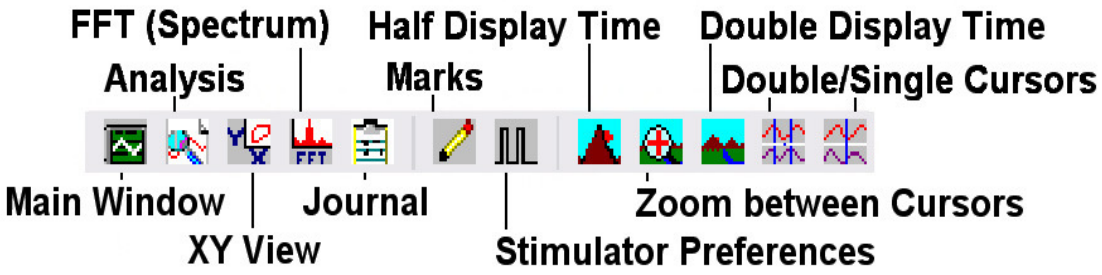

Figure HP-4-L1: LabScribe toolbar.

3. Once the cursors are placed in the correct positions for determining the mean skin temperature in the one minute recording, the value for the mean skin temperature can be recorded in the on-line notebook of LabScribe by typing the name and value of the parameter directly into the Journal.
4. The functions in the channel menu of the Analysis window can also be used to enter the name and value of the parameter from the recording to the Journal. To use these functions:
    - Place the cursors at the locations used to measure the mean skin temperature.
    - Transfer the name of the parameter to the Journal using the Add Title to Journal function in the Skin Temperature channel menu.
    - Transfer the value for the mean to the Journal using the Add Ch. Data to Journal function in the Skin Temperature channel menu.
7. On the Skin Temperature channel, use the mouse to click on and drag a cursor to the left margin of the data displayed on the Analysis window. Drag the other cursor to the right margin of the same data.
8. Record the value in the Journal using the one of the techniques described in Steps 5 or 6.
9. Enter the subject's mean skin temperature in Table HP-4-L1.

Exercise 2: Mild Psychosocial Stressor & Skin Temperature

Aim: To test if the sympathetic nervous system is activated by a mild psychosocial stressor.

When the sympathetic nervous system is activated in response to stress, a reduction in peripheral circulation occurs. This peripheral vasoconstriction leads to a reduction in skin temperature.

It is predicted that the subject's mean skin temperature decreases while the subject is doing mental arithmetic. During the follow-up period, the skin temperatures of some subjects will return to baseline levels. The skin temperatures of other subjects may take a longer time to return to baseline levels.

Procedure

1. The psychosocial stressor that will be used in this exercise is mental arithmetic. Inform the subject of the task that he or she will be doing:
    - When the subject hears the word Begin, he or she says 500 aloud.

- The subject mentally subtracts 7 from 500 and announces the result aloud.
- The subject continues to mentally subtract 7 from the previous result and announce the new result aloud, until he or she hears the word Stop.
- The subject should perform this task as quickly and as accurately as possible to reach the lowest possible value within one minute.

2. Type Begin Mental Math <Subject's Name> in the Mark box to the right of the Mark button. Click Record, click AutoScale for the Skin Temperature channel.
3. Press the Enter key on the keyboard as you say the word Begin. The subject should begin the mental arithmetic task immediately after hearing the word Begin. Continue recording.
4. Type Stop Mental Math in the Mark box. After the subject has performed the mathematical task for one minute, press the Enter key on the keyboard and say the word Stop. Continue to record.
5. Select Save As in the File menu, type a name for the file. Choose a destination on the computer in which to save the file, like your lab group folder). Designate the file type as *.iwxdata. Click on the Save button to save the data file.
6. Instruct the subject to sit quietly.
7. Type End Follow-Up in the Mark box. Press the Enter key on the keyboard at the end of the one-minute follow-up period.
8. Click Stop to halt the recording.
9. Select Save in the File menu.

Data Analysis

1. Scroll through the data file and locate the recording of the subject's skin temperature while performing the mathematical task.
2. Use the same procedures used in Exercise 1 to position the data in the Main window, display the selected data in the Analysis window, and measure value for the subject's mean skin temperature while performing the mathematical task.
3. Record the value of this parameter in the Journal using the one of the techniques described in Exercise 1, and in Table HP-4-L1.
4. Scroll through the data file and locate the recording of the subject's skin temperature during the follow-up period.
5. Repeat Steps 2 and 3 to find and record the subject's mean skin temperature during the follow-up period.

Questions

1. Does the subject's mean skin temperature decrease during the mental arithmetic task?
2. Does the subject's mean skin temperature increase during the recovery period?

3. Does the subject's mean skin temperature return to the baseline level during the recovery period? If it did not return to the baseline level, what percentage of the return did it make?
4. Do these results support the hypothesis put forth at the beginning of this exercise?

Exercise 3: Calming Mental Imagery & Skin Temperature

Aim: To demonstrate the effect of relaxing mental imagery and biofeedback on skin temperature.

After stressful events subside, the parasympathetic nervous system is more active. One indicator of parasympathetic activity is an increase in peripheral circulation through vasodilation, which can be indicated by an increase in skin temperature.

In this exercise, the change in skin temperature represents the degree of relaxation experienced by the subject.Therefore, it is predicted that the subject's mean skin temperature will be higher while the subject is using mental imagery and biofeedback to enhance his or her state of relaxation than during the baseline period. During the follow-up period, skin temperatures of some subjects will return to their baseline levels. Temperatures of other subjects may take a longer time to return to their baseline levels.

Procedure

1. In this exercise, the subject's goal is to warm his or her hands as much as possible using relaxing mental imagery and biofeedback regarding the consequences of the imagery.
2. Before the beginning of the exercise, instruct the subject to select the imagery that he or she will use during the biofeedback period. During the biofeedback period, if the subject determines that the imagery being used is ineffective, the subject can change the imagery employed.
3. There are three phases in this exercise:
    - Phase 1: The subject sits quietly for one minute without using imagery or biofeedback, and while facing away from the computer screen.
    - Phase 2: The subject faces the computer screen and watches the recording of his or her skin temperature. The subject can watch either the recording of the skin temperature as it scrolls across the screen or the digital readout of the skin temperature on the right side of the Main window. To display the digital readout of the subject's skin temperature, pull down the View menu on the LabScribe Main window and selecting Voltmeter. Regardless of the temperature display the subject watches, the goal of the subject in this phase of the exercise is to raise his or her skin temperature.
    - Phase 3: The subject sits quietly for one minute without using biofeedback, and while facing away from the computer screen.
4. Once the seven minute exercise begins, there should be no talking in the room. All the members of the lab group, except the subject, should leave the room during the five minute imagery/biofeedback phase of the experiment.
5. Instruct the subject to prepare for the first phase of the exercise. The subject should sit quietly while comfortably resting the hand with the thermistor in his or her lap.

6. Type No Imagery <Subject's Name> in the Mark box to the right of the Mark button.
7. Click Record, and press the Enter key on the keyboard. Record the subject's skin temperature for one minute. Click Stop to halt the recording.
8. Ask the subject to turn and face the computer screen. The subject should sit quietly while watching the computer screen and comfortably resting the hand with the thermistor in his or her lap.
9. Type Imagery/Biofeedback in the Mark box to the right of the Mark button.
10. Click Record, and press the Enter key on the keyboard. Quietly leave the room for five minutes as the subject's skin temperature is recorded.
11. Quietly return to the room at the end of the Imagery/Biofeedback phase of the exercise, and click Stop to halt the recording.
12. Ask the subject to face away from the computer screen. The subject should sit quietly while comfortably resting the hand with the thermistor in his or her lap.
13. Type No Biofeedback in the Mark box to the right of the Mark button.
14. Click Record, and press the Enter key on the keyboard. Record the subject's skin temperature for one minute. Click Stop to halt the recording.
15. Record the subject's skin temperature for a minute. Click Stop to halt the recording.
16. Select Save in the File menu.

Data Analysis

1. Scroll through the data file and locate the recording of the subject's skin temperature during Phase 1 - No Imagery.
2. Use the same procedures used in Exercise 1 to position the data in the Main window, display the selected data in the Analysis window, and measure the value for the subject's mean skin temperature in Phase 1.
3. Record the value of this parameter in the Journal using the one of the techniques described in Exercise 1, and in Table HP-4-L1
4. Scroll through the data file and locate the recording of the subject's skin temperature during Phase 2- Imagery/Biofeedback.
5. Repeat Steps 2 and 3 to find and record the subject's mean skin temperature during Phase 2.
6. Scroll through the data file and locate the recording of the subject's skin temperature during Phase 3- No Biofeedback.
7. Repeat Steps 2 and 3 to find and record the subject's mean skin temperature during Phase 3.

Table HP-4-L1:Skin Temperature - Different Experimental Conditions

Subject_____	
Experimental Condition	Skin Temperature (^{o}F)
Baseline	
Mental Arithmetic	
Post-Mental Arithmetic	
No Imagery	
Imagery/Biofeedback	
No Biofeedback	

Questions

1. Is the subject's mean skin temperature higher during Phase 2 - Imagery/Biofeedback than during Phase 1 - No Imagery?
2. Is the subject's mean skin temperature higher during Phase 2 - Imagery/Biofeedback than during Phase 3 - No Biofeedback?
3. Was the subject successful at the imagery/biofeedback task? The subject is successful at this task if his or her mean skin temperature for the imagery/biofeedback phase of the exercise is higher than the phases with no imagery and no biofeedback. During Phase 3 - No Biofeedback, if the subject's skin temperature does not return to the same level recorded in Phase 1 - No Imagery, it cannot be assumed the subject learned biofeedback control. Learning is demonstrated when the changes in skin temperature can be attributed to mental focus and feedback, and not just to time.

Exercise 4: Embarrassability, Blushing, and Gender

Aim: To measure any change in the subject's skin temperature and galvanic skin response (GSR) during an embarrassment task. To relate the subject's responses to the embarrassment task to his or her gender and embarrassability.

In this exercise, the data that is collected will help you determine if gender and embarrassability influence changes in cheek skin temperature and skin conductance between a baseline task and an embarrassment task. An increase in cheek skin temperature indicates vasodilation in that area, which could be seen as blushing. The skin conductance is being recorded as a measure of the amount of autonomic arousal in the subject.

Temperature Probe and GSR Setup

1. Locate the GSR-200 galvanic skin response amplifier, male-male DIN8 cable, and GSR electrodes (Figure HP-4-L2) in the iWorx kit.

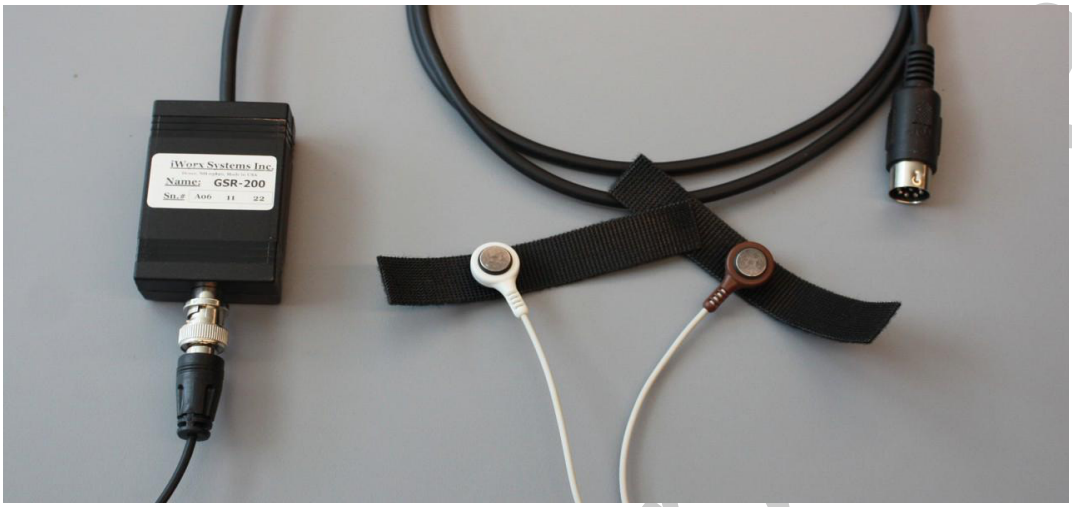

Figure HP-4-L2: The GSR-200 galvanic skin response amplifier.

2. Plug one end of the male-male DIN8 cable into the female DIN8 connector on the GSR-200 galvanic skin response amplifier. Plug the other end of the DIN8 cable into the Channel 4 input of the iWX/214 (Figure HP-4-L3).

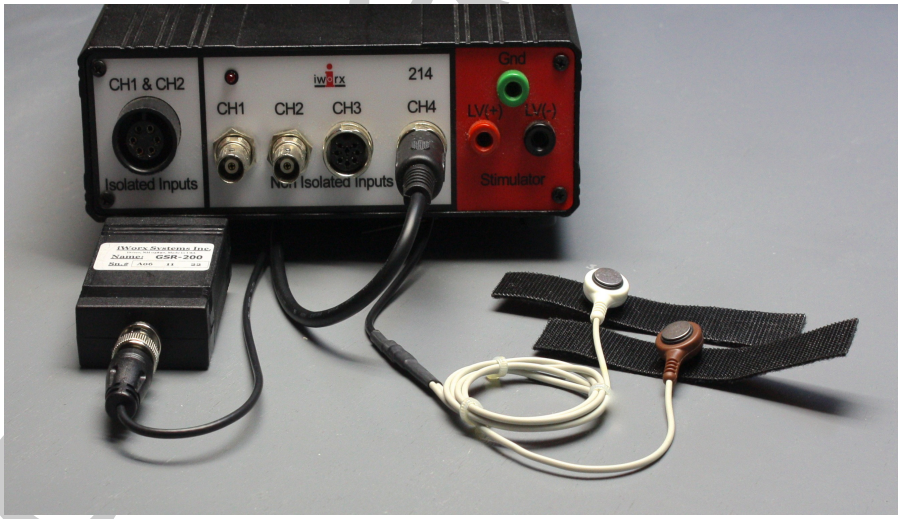

Figure HP-4-L3: The TM-100 and GSR-200 connected to an IWX214.

Calibration of GSR Amplifier

1. Click on the Save to Disk button in the lower left corner of the Main window to switch the

LabScribe software into Preview mode. When LabScribe is in Preview mode, there is a red X across the Save to Disk button. In Preview mode, the iWorx recording system works without recording data on the hard drive or any other storage media.

2. Click on the Preview button; record data for 1 minute.
3. Click on the Stop button.
4. Set the baseline to zero:
    - Click the down arrow to the left of the GSR channel to open the Channel Menu.
    - Click Units
    - Click Set Offset (Figure HP-4-L4)
    - Set the offset to 0 and check Apply to all blocks
    - Click OK.

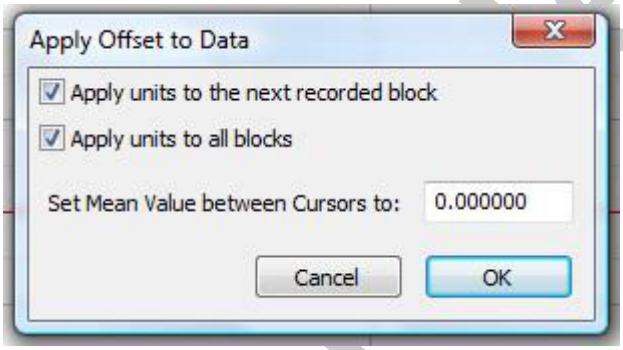

Figure HP-4-L4: Apply Offset window for setting the GSR unit to "0".

Note: *If the user clicks the Preview button and an error window appears the Main window indicating the iWorx hardware cannot be found, make sure the iWorx unit is turned on and connected to the USB port of the computer. Then, click on the OK button in the error window. Pull down the LabScribe Tools menu, select the Find Hardware function, and follow the directions on the Find Hardware dialogue window*

5. Before proceeding to the actual exercises, make sure the LabScribe software is set to Record mode. Click on the Save to Disk button, in the lower left corner of the Main window, to change LabScribe from Preview mode to Record mode.
6. When LabScribe is in Record mode, there is a green arrow on the Save to Disk button.
7. To check the programming of the calibration:
    - Click on the arrow next to the title of the Skin Conductance Level channel to open the channel menu.
    - Select Units from the channel menu and Simple from the Units submenu.
    - The Simple Units Calibration window will appear with the values for the two-point calibration of the GSR-200 amplifier already entered. (Figure HP-4-L4).

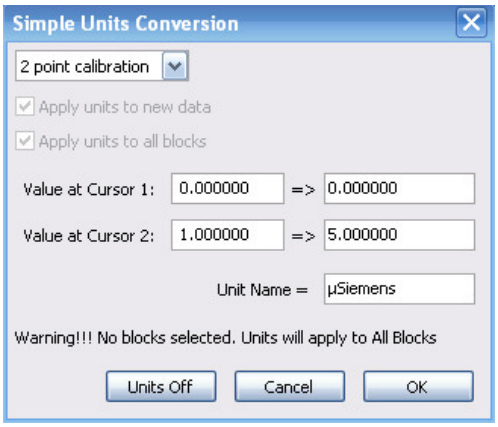

Figure HP-4-8: Simple Units Conversion window for GSR-200 amplifier.

Procedure

1. Each person in your group will be an experimental subject in this exercise. Randomize the order in which members of your group participate.
2. There are three experimental conditions in this exercise. During the exercise, you will also need to enter comments to indicate:
    - Baseline Task: The subject sits and reads some neutral material from the textbook for one minute.
    - Embarrassment Task: The subject performs the embarrassment task for a period of one minute. The tasks are randomly drawn. These tasks include:
        1. Singing a common nursery rhyme, such as Row, Row, Row Your Boat or Three Blind Mice, out loud.
        2. Reading a part from a play, as if trying out for the part in front of the directors.
        3. Reading an expressive poem, out loud.
        4. Talking about the most embarrassing thing that ever happened to you.
    - Post-Embarrassment Task: The subject returns to reading quietly from the text for one minute.
3. Before the subject performs this exercise, he or she should 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.
4. Connect the GSR electrodes to the BNC connector on the GSR-200 amplifier.
5. The subject should sit with his or her back to the computer monitor. Use the subject's hand which is closer to the iWorx equipment.
6. 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.
7. The subject should rest his or her hand with the GSR electrodes 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 will introduce artifacts into the recording.

8. Attach the thermistor to the subject's cheek by placing surgical tape over the wires near the tip, not over the tip. Cover the tip with an adhesive bandage to prevent the air in the room from dissipating the heat near the thermistor. Only the tip of the thermistor should be in contact with the face. The extension cable from the thermistor to the iWorx unit can be held by the subject to prevent the thermistor from being pulled off the cheek.
9. Type Tonic SCL <Subject's Name> in the Mark box that is to the right of the Mark button.
10. Click on the Record button. Press the Enter key on the keyboard. Since the GSR amplifier was zeroed in the Calibration section of this exercise, the value displayed on the Skin Conductance Level channel is the tonic skin conductance level (SCL) of the subject. This value should be between 2 and 20 µSiemens. Record the subject's tonic SCL for one minute.
11. After recording the subject's tonic SCL adjust baseline of the recording to zero. Continue recording.
12. Type Baseline Task in the Mark box. Instruct the subject to sit quietly and read from a text. Press the Enter key on the keyboard. Record the subject's skin temperature and skin conductance level for one minute. Click Stop to halt the recording.
13. Type Embarrassment Task in the Mark box.
14. Instruct the subject to draw a slip of paper from the envelope provided to your group. Each slip of paper has an embarrassment task written on it.
15. Click Record as the subject is reading the task that he or she has to perform. Press the Enter key on the keyboard as the subject begins the task. Record the subject's skin temperature and skin conductance level for one minute. Click Stop to halt the recording.

Note:*If the subject is unwilling to perform the embarrassment task then have everyone in your group sing Happy Birthday or You are My Sunshine to the subject for the one minute.*

16. Type Post-Embarrassment in the Mark box. Instruct the subject to sit quietly and read from a text. Click Record and press the Enter key on the keyboard. Record the subject's skin temperature and skin conductance level for one minute. Click Stop to halt the recording.
17. Select Save As in the File menu, type a name for the file. Choose a destination on the computer in which to save the file, like your lab group folder). Designate the file type as *.iwxdata. Click on the Save button to save the data file.
18. Repeat this exercise for each member of your group. Keep track of the order of subjects in the Journal.

Data Analysis

1. Find the beginning of the first subject's recording of tonic skin temperature and conductance level.

2. Use the same procedures used in Exercise 1 to position the data in the Main window, display the selected data in the Analysis window, and measure value for the subject's mean skin temperature and tonic skin conductance level.
3. Record the names and values of these parameters in the Journal using the one of the techniques described in Exercise 1, and in Table HP-4-L2. If you are entering values for the means to the Journal using the functions in the channel menu, use the Add All Data to Journal function to enter the values for the mean skin temperature and mean skin conductance level to the Journal at the same time.
4. Scroll through the data file and locate the recording of the subject's skin temperature and conductance level during Baseline Task.
5. Repeat Steps 2 and 3 to find and record the subject's names and values of the means during the Baseline Task.
6. Scroll through the data file and locate the recording of the subject's skin temperature and conductance level during Embarrassment Task.
7. Repeat Steps 2 and 3 to find and record the subject's names and values of the means during the Embarrassment Task.
8. Scroll through the data file and locate the recording of the subject's skin temperature and conductance level during Post-Embarrassment Task.
9. Repeat Steps 2 and 3 to find and record the subject's names and values of the means during the Post-Embarrassment Task.

Embarrassability Rating Scale (ERS)

1. Read each situation in Table HP-4-L3. Rate how much embarrassment you would be likely to feel in each case. Embarrassment is an unpleasant feeling of self-consciousness, awkwardness, and a desire to escape the situation and the presence of others. A rating of 0 indicates no embarrassment at all; a rating of 4 indicates extreme or considerable embarrassment. Ratings of 1, 2 or 3 lie between those extremes.
2. Circle your rating for each situation. Total your score for all ten items. Scores can range from 0 to 40.

Class Data

1. The recordings from all three task periods of each subject should be analyzed using the instructions from Exercise 4.
2. Each subject should anonymously enter her or his gender, embarrassability score, mean skin temperature from each task, and mean skin conductances from each task on the class data sheet.
3. Divide the class results into two groups using the median value from the class scores on the Embarrassability Rating Scale. Subjects with scores above the median value are assigned to the high embarrassability group, and subjects below the median value are assigned to the low embarrassability group.

4. Calculate the group averages for the mean skin temperatures and conductances for each experimental condition for both embarrassability groups.

Table HP-4-L2:Effect of Embarrassment on Skin Temperature and Conductance

Subject_____	Gender_____	ERS_____
Experimental Condition	Mean Skin Temperature (^{o}C)	Mean Skin Conductance Level (µS)
Tonic		
Baseline Task (1)		
Embarrassment Task (2)		
Post-Embarrassment Task (3)		
Mean Elevation (2-1)		

Experimental Hypotheses

Aim: To test three experimental hypotheses regarding the effect of gender and embarrassability on blushing (measured as changes in skin temperature and conductance).

Hypothesis 1

Hypothesis 1: Persons who score as "high" on the embarrassability scale blush to a greater degree (greater mean elevation in cheek temperature) during the embarrassment task than persons who score as "low" on the embarrassability scale.

1. Compare the group average for the mean elevations in skin temperature from the high embarrassability group to the group average of the low embarrassability group.
2. Does the high embarrassability group have higher mean elevation in skin temperature?
3. Does the class data support Hypothesis 1?
4. How would the results be affected if subjects were not "accurate" when they performed their embarrassability ratings?

Hypothesis 2

Hypothesis 2: Females blush to a greater degree (greater mean elevation in cheek temperature) during the embarrassment task than males.

1. What percentage of the female subjects are in the high embarrassability group? What percentage of the males are in the high embarrassability group?

2. Compare the group average for the mean elevations in skin temperature from the female group to the group average of the male group.
3. Does the female group have a higher mean elevation in skin temperature?
4. Does the class data support Hypothesis 2?
5. How would the results be affected if subjects were not "accurate" when they performed their embarrassability ratings?

Hypothesis 3

Hypothesis 3: Mean elevations in skin conductance levels are correlated to mean elevations in cheek temperature.

1. Plot the mean elevation in cheek temperature of each subject as a function of his or her mean elevation in skin conductance. Plot all subjects on the same graph. Mark points for subjects in the high embarrassability group with crosses, and points for subjects in the low embarrassability group with circles.
2. Does mean elevation in skin temperature correlate with mean elevation in skin conductance? Is this relationship linear? Are the crosses clustered in one region of the graph, and the circles clustered in another region of the graph?
3. Are the group averages for mean elevation in skin temperature and conductance higher in the high embarrassability group than in the low embarrassability group? Does this comparison correlate with the graph?
4. Does the class data support Hypothesis 3?

Table HP-4-L3:Embarrassability Rating Scale

Situation	Rating (0-4)				
	No Embarrassment				Extreme Embarrassment
People are singing “happy birthday” to you at a party.	0	1	2	3	4
You just knocked over your glass at the table of an important dinner party.	0	1	2	3	4
You find yourself in the elevator alone with your favorite professor and can’t think of anything to say.	0	1	2	3	4
You’ve just been called on unexpectedly by a professor to answer a question.	0	1	2	3	4
Compared to everyone else, you seem inappropriately dressed for a social event.	0	1	2	3	4
You trip and fall dropping your books while walking up the stairs to class.	0	1	2	3	4
You are at a play and it is clear that the actor has forgotten his lines.	0	1	2	3	4
You have to stand and introduce yourself to others on the first class day.	0	1	2	3	4
Your date spills spaghetti sauce on his/her clothes on the first date.	0	1	2	3	4
You walk into a bathroom you thought was empty at someone’s house and find a member of the opposite sex.	0	1	2	3	4

Score_____

References

Leary, M. R. & Meadows, S. (1991). Predictors, Elicitors, and Concomitants of Social Blushing. Journal of Personality and Social Psychology, 60(2), 254-262.

Shearn, D., Bergman, E., Hill, K., Abel, A., & Hinds, L. (1990). Facial Coloration and Temperature Responses in Blushing. Psychophysiology, 27(6), 687-693.