

Experiment HP-2: The Galvanic Skin Response (GSR) and Emotion

Exercise 1: Tonic SCL and Habituation

Aim: To measure the subject's tonic skin conductance level, observe possible spontaneous skin responses, and habituate the subject to the questioning paradigm used in this experiment.

Procedure

1. 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.
2. Connect the GSR electrodes to the BNC connector on the GSR-200 amplifier.
3. 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.
4. 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.
5. 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.
6. Two measurements are performed in this exercise:
 - Tonic Skin Conductance Level: In this measurement, the subject sits quietly for one minute as his or her tonic skin conductance level (SCL) is recorded. Any movement may cause an artifact in the recording.
 - Habituation: In this measurement, the subject's tonic skin conductance level (SCL) is recorded as he or she sits quietly and without movement. While recording the subject's SCL, ask the subject the question: Is your name, X? (where X is the subject's real name). The subject should respond: Yes. After the subject's SCL changes and then returns to the baseline, ask the subject the same question. Continue to ask this same question until the subject shows no response on three consecutive trials. Lack of a change in the subject's SCL while answering the question is considered habituation.
7. Type First Tonic SCL <Subject's Name> in the Mark box that is to the right of the Mark button.
8. 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 ([Figure HP-2-L1](#)). This value should be between 2 and 20 μ Siemens. Record the subject's tonic SCL for one minute.

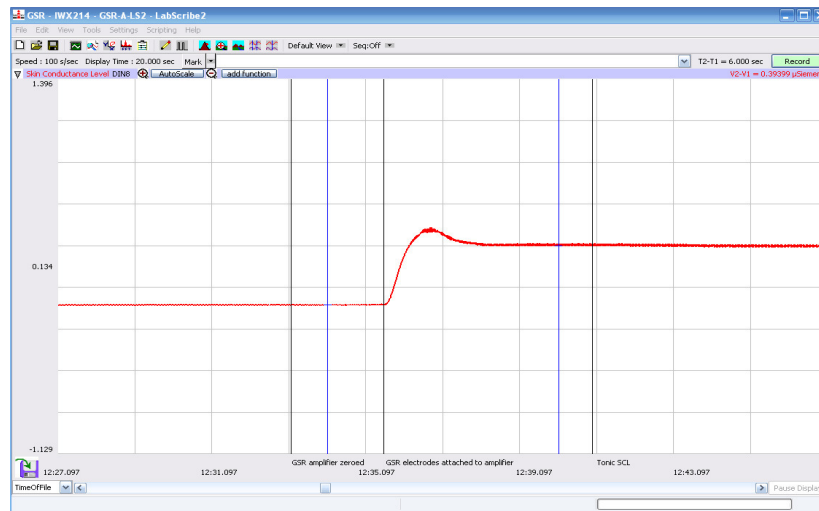


Figure HP-2-L1: The output of the GSR amplifier before and after the GSR electrodes, which are already on the fingers of the subject, were connected to the amplifier. The difference between the output of the amplifier before and after the connection of the electrodes is the tonic skin conductance level of the subject, which is 0.394 microSiemens (μS).

9. After recording the subject's tonic SCL, use the Offset Directions from page 4 to adjust baseline of the recording to zero.
10. Type Baseline <Subject's Name> in the Mark box and press the Enter key on the keyboard.
11. Type Is Your Name, <Subject's Name>? in the Mark box Press the Enter key on the keyboard as the subject is asked the question. Continue recording.
12. Type IYNX (Is Your Name, X?) in the Mark box. When the subject's tonic skin conductance level is response to the previous question has returned to the baseline, press the Enter key on the keyboard and ask the question again.
13. Repeat Step 11 until the subject shows no response to the question for three consecutive times. Click Stop to halt the recording.
14. 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.
15. Repeat this exercise on other subjects in your lab group.

Data Analysis - Tonic Skin Conductance Level

1. Scroll through the data file and locate the recording of the subject's tonic 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 tonic SCL 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 SCL, and
 - Clicking the Zoom between Cursors button on the LabScribe toolbar ([Figure HP-2-L2](#)) 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.

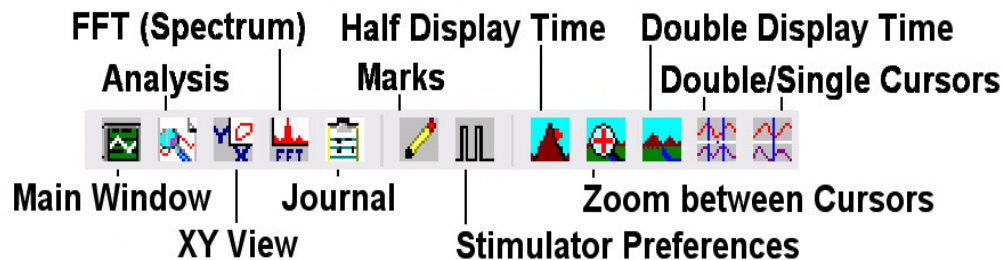


Figure HP-2-L2: The LabScribe toolbar.

4. Look at the Function Table that is above the Skin Conductance Level channel in the Analysis window. The mathematical function, Mean, should appear in this table. The value for mean tonic skin conductance level is displayed in the table across the top margin of the Skin Conductance Level channel.
5. Once the cursors are placed in the correct positions for determining the mean tonic skin conductance level in the one minute recording, the value for the mean tonic 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. The functions in the channel menu of the Analysis window can also be used to enter the names and values of the parameters from the recording to the Journal. To use these functions:
- Place the cursors at the locations used to measure the mean tonic skin conductance level.
 - Transfer the name of the parameter to the Journal using the Add Title to Journal function in the Skin Conductance Level channel menu.
 - Transfer the value for the mean to the Journal using the Add Ch. Data to Journal function in the Skin Conductance Level channel menu.
7. On the Skin Conductance Level 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 values in the Journal using the one of the techniques described in Steps 5 or 6.
9. Enter the value for the mean tonic skin conductance level for the subject in [Table HP-2-L1](#).

Data Analysis - Spontaneous Skin Conductance Responses

1. On the one minute recording of the subject's tonic skin conductance level displayed in the

Analysis window, count the number of spontaneous skin conductance responses that occurred during the one minute recording of the subject's tonic skin conductance.

Note: Changes in the subject's skin conduction level (SCL) which are upward deflections equal to or greater than $0.05 \mu\text{S}$ are counted as spontaneous skin conduction responses. The SCL does not need to return to the baseline value before another response takes place.

2. Enter the number of spontaneous skin conductance responses that occurred in the one minute recording in the Journal by typing the value directly into that window.
3. Enter the number of spontaneous skin conductance responses per minute for the subject in [Table HP-2-L1](#).

Data Analysis - Habituation

1. Click on the Main window icon to return to viewing the data on the Main window. Scroll through the data file and locate the recording of the habituation SCL for the subject.
2. Use the Display Time icons to adjust the Display Time of the Main window to display the complete habituation period on the Main window.
3. Determine the subject's habituation score by counting the number of times the question, Is your name, <Subject's Name>? was asked before the habituation criterion was reached. Each time the question is asked is considered a trial. The habituation criterion is reached when there is no skin conductance response from the subject for three consecutive trials. For example, if the subject first shows no skin conductance response to the question in the sixth trial, and no responses in the seventh and eighth trials, the subject's habituation score is six. Typical habituation scores are between two and eight.

Note: Some spontaneous skin responses may occur during the habituation test. Do not count spontaneous responses in the habituation score. Only count a trial as a skin conductance response to the question when the response begins within three seconds of the question and the skin conductance change is equal to or greater than $0.05 \mu\text{S}$.

4. Enter the subject's habituation score in the Journal by typing the value directly into that window.
5. Enter the subject's habituation score in the table.
6. Enter the value for the tonic skin conductance level, the number of spontaneous skin responses per minute, and the habituation score for all the subjects in your group into the table. The class data will be used in Exercise 7.

Table HP-2-L1: Tonic SCL, Spontaneous Skin Responses, and Habituation

Subject	Mean Tonic SCL (μS)	Spontaneous Skin Responses (Number/Minute)	Habituation Score (Trials before Habituation)

Exercise 2: Orienting Response - Neutral Content

Aim: To determine the change in the skin conductance level and the peak response rise time of a subject responding to a series of neutral content questions.

Procedure

1. The same subject that performed Exercise 1 should participate in this exercise.
2. The subject will be asked a series of ten questions with a neutral content ([Table HP-2-L2](#)). Instruct the subject to sit quietly and to answer each question truthfully with either a Yes or a No. The subject should not elaborate on any answer.
3. Type Second Tonic SCL <Subject’s Name> in the Mark box that is to the right of the Mark button. Click on the Record button. Press the Enter key on the keyboard. Record the subject’s tonic skin conductance level for one minute. Continue recording.

Note: If the subject’s tonic SCL has changed, use the offset directions to adjust the SCL value to zero.

4. Type NC1 (for Neutral Content Question 1) in the Mark box that is to the right of the Mark button. Press the Enter key on the keyboard to mark the recording as the subject is asked the first question with neutral content. Continue recording.
5. Before asking the next question:
 - Type the number of the next neutral content question (NC2, NC3....) in the Mark box.
 - Wait for the subject’s skin conductance level to return to the baseline level before asking the next question.
 - Wait for any spontaneous skin responses to return to their baseline frequency before

asking the next question.

6. Press the Enter key on the keyboard to mark the recording as the subject is asked the next question with neutral content. Continue recording.
7. Repeat Steps 5 and 6 for the remaining eight questions in the list ([Table HP-2-L2](#)).
8. When the subject's skin conductance response to the tenth question is completed, 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 conductance response to the first question in the list of neutral content questions.
2. Use the Display Time icons to adjust the Display Time of the Main window to display the complete response to the first question on the Main window. This section of data can also be selected by:
 - Placing the cursors on either side of the subject's skin conductance response to the first question, and
3. Clicking the Zoom between Cursors button on the LabScribe toolbar ([Figure HP-2-L2](#)) to expand or contract this section of the recording to the width of the Main window.

Table HP-2-L2: Neutral Content Questions

1. Do you live in a dormitory?
2. Do you like broccoli?
3. Do you have a cat?
4. Are you a senior?
5. Have you ever gone ice skating?
6. Do you sometimes ride a bike to school?
7. Have you ever been to Alaska?
8. Do you have a sister?
9. Were you born in [State or Country]?
10. Are you a psychology major?

4. 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.
5. Look at the Function Table that is above the Skin Conductance Level channel in the Analysis window. The functions, Value1, Value 2, V2-V1, and T2-T1, should appear in this table. The values for these functions are displayed in the table across the top margin of the Skin Conductance Level channel.
6. On the Skin Conductance Level channel, use the mouse to click on and drag a cursor to the point in the recording when the question was asked. Drag the other cursor to peak of the subject's response to the question. The following parameters of the subject's response are measured by the functions listed in the table:
 - Baseline Skin Conductance Level, which is the skin conductance level of the subject at the time the question was asked. The value for the Value1 function on the Skin Conductance Level channel is the baseline skin conductance level.
 - Peak Response Skin Conductance Level, which is the maximum skin conductance level of the subject in the period after the question was asked. The value for the Value2 function on the Skin Conductance Level channel is the skin conductance level of the peak response of the subject.
 - Change (Δ) in Skin Conductance Level, which is the difference between the baseline and maximum skin conductance levels of the subject in response to the question. The value for the V2-V1 function on the Skin Conductance Level channel is the change in the skin conductance level of the subject.
 - Peak Response Rise Time, which is the time between the question being asked and the peak response of the subject to the question. The value for the T2-T1 function on the Skin Conductance Level channel is the rise time of the peak response.

Note: In this exercise, it would not be useful to calculate the latency, which is the time between the mark indicating the question and the onset of the response. The questions in this exercise are not brief discrete events; each question is a different length and takes a different time to ask. Latency will be measured in another exercise in another context.

7. Record the values for these functions in the Journal using the one of the techniques described in Exercise 1.
8. Enter the values for the baseline skin conductance level, peak response SCL, change in SCL, and rise time of the peak response for the first question in [Table HP-2-L3](#).
9. Repeat Steps 1 through 7 for the other nine neutral content questions in the list.

Table HP-2-L3: Skin Conductance Changes for Neutral Content Questions

Questions	Baseline SCL (μS)	Peak Response SCL (μS)	Δ in SCL (μS)	Peak Response Rise Time (seconds)
1. Do you live in a dormitory?				
2. Do you like broccoli?				
3. Do you have a cat?				
4. Are you a senior?				
5. Have you ever gone ice skating?				
6. Do you sometimes ride a bike to school?				
7. Have you ever been to Alaska?				
8. Do you have a sister?				
9. Were you born in [State or Country]?				
10. Are you a psychology major?				

Exercise 3: GSR & Emotional Content

Aim: To determine the change in the skin conductance level and the peak response rise time of a subject responding to a series of questions with either neutral or emotional content.

Procedure

1. The same subject that performed Exercise 2 should participate in this exercise.
2. If possible, keep the subject uninformed about the design and purpose of this exercise. However, this might not be possible if the subject read the manual before coming to class. At the very least, make sure the subject is unaware of the sequence in which the questions will be asked.
3. The subject will be asked a total of ten questions, seven new questions with neutral content and three questions of an emotional nature.
4. Without informing the subject, randomize the position of the questions with emotional content

in the list of questions to be asked. To randomly place the questions with emotional content on the list of questions, perform a blind draw of three pieces of paper, each marked with a number from 2 through 10. No paper marked with the number 1 is placed in the draw to insure that the first question will be one with neutral content. The three numbers drawn indicate the positions of the questions with emotional content in the list of ten questions.

5. Select three questions with emotional content. They should not be intrusive, and they should involve common emotional experiences. [Table HP-2-L4](#) contains good examples of questions with emotional content.
6. Select seven new questions with neutral content. [Table HP-2-L5](#) contains good examples of this type of question.
7. Instruct the subject to sit quietly and to answer each question truthfully with either a Yes or a No. The subject should not elaborate on any answer.
8. Type Third Tonic SCL <Subject's Name> in the Mark box that is to the right of the Mark button. Click on the Record button. Press the Enter key on the keyboard. Record the subject's tonic skin conductance level for one minute. Continue recording.

Note: If the subject's tonic SCL has changed, use the offset directions to adjust the SCL value to zero.

Table HP-2-L4: Questions with Emotional Content

- Are you in love?
- Do you ever cry?
- Does nudity embarrass you?
- Do you recall your first kiss?
- Does being alone at night frighten you?
- Have you ever seen a tragic auto accident?
- Have you ever heard about a date rape?
- Do you ever hide some of your feelings?
- Do you believe in the practice of "safe sex?"

Table HP-2-L5: Questions with Neutral Content

- Is today (Tuesday)?
- Did you watch TV last night?
- Do you like pizza?
- Have you ever been to a professional baseball game?
- Do you have a car?
- Are you taking a PE class?
- Do you like to go to movies?

9. Type NQ1 (for Neutral Question 1) in the Mark box that is to the right of the Mark button. Press the Enter key on the keyboard to mark the recording as the subject is asked the first question. Continue recording.
10. Before asking the next question:
 - Type the number of the next question (NQ2 or EQ2 for Neutral or Emotional Question 2) in the Mark box.
 - Wait for the subject's skin conductance level to return to the baseline level before asking the next question.
 - Wait for any spontaneous skin responses to return to their baseline frequency before asking the next question.
11. Press the Enter key on the keyboard to mark the recording as the subject is asked the next question. Continue recording.
12. Repeat Steps 10 and 11 for the remaining eight questions in the list, labeling each neutral question as NQ and each emotional question as EQ.
13. When the subject's skin conductance response to the tenth question is completed, click Stop to halt the recording.
14. Select Save in the File menu.



Figure HP-2-8: Skin conductance level of a subject responding to multiple questions.

Data Analysis

1. Scroll through the data file and locate the recording of the subject's skin conductance response to the first question in the list of neutral and emotional content questions.
2. Use the same procedures used in Exercise 2 to position data in the Main window, display the selected data in the Analysis window, and measure values for the following parameters of the response to the first question:
 - Baseline Skin Conductance Level, which is the skin conductance level of the subject at the time the question was asked. The value for the Value1 function on the Skin Conductance Level channel is the baseline skin conductance level.
 - Peak Response Skin Conductance Level, which is the maximum skin conductance level of the subject in the period after the question was asked. The value for the Value2 function on the Skin Conductance Level channel is the skin conductance level of the peak response of the subject.
 - Change (Δ) in Skin Conductance Level, which is the difference between the baseline and maximum skin conductance levels of the subject in response to the question. The value for the V2-V1 function on the Skin Conductance Level channel is the change in the skin conductance level of the subject.
 - Peak Response Rise Time, which is the time between the question being asked and the peak response of the subject to the question. The value for the T2-T1 function on the Skin Conductance Level channel is the rise time of the peak response.
3. Record the values for these functions in the Journal using the one of the techniques described in Exercise 1.
4. Enter the values for the baseline skin conductance level, peak response SCL, change in SCL,

and rise time of the peak response for the first question in [Table HP-2-L6](#).

- Repeat Steps 1 through 4 for the other nine questions in the list.
5. Determine the mean change in SCL and the mean rise time of the peak response for the three emotional questions. Also, determine the mean change in SCL and the mean rise time of the peak response for the seven neutral questions. Enter these means on [Table HP-2-L6](#).

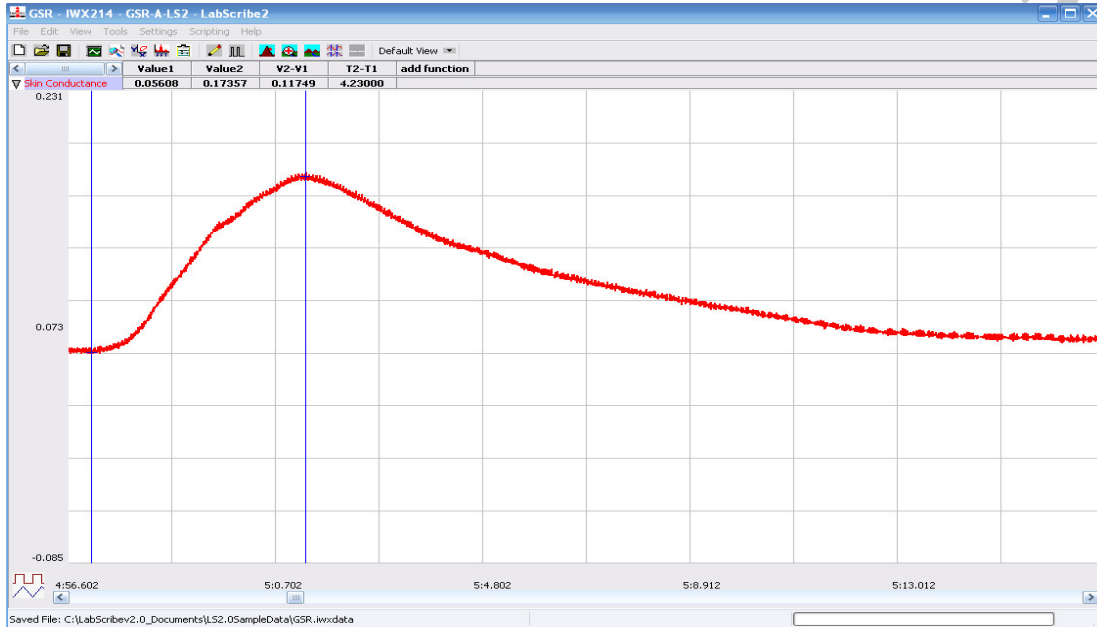


Figure HP-2-L3: Skin conductance level of a subject responding to an emotional question displayed in the Analysis window. The cursors are in positions to measure the baseline SCL (V1), the peak SCL (V2), the change in SCL (V2-V1), and the rise time (T2-T1).

6. Compare the mean change in SCL and the mean rise time of the peak response for the emotional questions to those of the neutral questions. It is expected that the mean change in SCL is greater and the mean rise time is shorter for the questions with emotional content than for the questions with neutral content.

Note: Since there are many GSR exercises that can be done. Your instructor may choose to stop after Exercise 3, and have your class complete the other four exercises in this experiment during another lab period.

Table HP-2-L6: Comparison of Skin Conductance Changes for Emotional and Neutral Content Questions.

Questions	Neutral (N) Emotional (E)	Baseline SCL (μ S)	Peak Response SCL (μ S)	Δ in SCL (μ S)	Peak Response Rise Time (seconds)
1.	N				
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
Means for 7 Neutral Questions	N				
Means for 3 Emotional Questions	E				