

Vital lab worksheet #05

Psychophysiology

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Analysis:

Exercise 1: The startle response

1. Examine the data in the Chart View window.
2. Place the marker on the data trace where the comment was added, signifying a stimulus.
3. Place the waveform cursor on the peak in the skin conductance tracing.
4. Record the change in amplitude and the latency (time from stimulus onset to peak response) in Table 1 of the Data Notebook.
5. Repeat steps 2-4 for the other stimulus events in the recording.
6. Calculate the mean skin conductance change and mean latency and record the values in Table 1 of the Data Notebook.
7. If this exercise was performed on other people in the group, record their average response and latency separately from other people's data.

Exercise 2: Skin conductance and skin temperature during mild stress

1. Examine the data in the Chart View window.
2. Select data in both channels from the first minute of the trace, before the subject was asked to perform mental arithmetic.
3. Click the Data Pad button from the Chart Toolbar.
4. The Data Pad will appear, and display the average values for skin conductance and skin temperature in columns one and two.
5. Record these values in Table 2 of the Data Notebook under the heading "Baseline Values".
6. Return to the Chart View window, and examine the data in the section of the trace during which the volunteer was performing mental arithmetic.
7. Each blank comment represents when the subject announced a number. Select several seconds of data around the first blank comment. Return to the Data Pad by clicking the Data Pad button from the Chart Toolbar. Record the average skin conductance and skin temperature in Table 2 of the Data Notebook under the heading "Stress".
8. Repeat steps 6-7 for each of the blank comments in the mental arithmetic section of the data trace.
9. Select the last thirty seconds of the recording (the relaxation period), and determine the mean skin temperature and skin conductance values. Record them in Table 2 of the Data Notebook under the heading "Recovery."
10. If this exercise was performed on multiple group members, each person in the group should record their own results and then share them with the other members of the group or class.

Exercise 3: A simple lie detector experiment

Baseline data

1. Examine the data from the baseline question segment of the recording.
2. Using the waveform cursor, determine and record the skin conductance, skin temperature and heart rate ten seconds before and ten seconds after each question was answered. Record these values in Table 3 of the Data Notebook.
3. Determine the change in skin conductance, skin temperature, and heart rate for each of the baseline questions, and enter the values in Table 3 of the Data Notebook.
4. Calculate the average change in skin conductance, skin temperature and heart rate for the volunteer subject and record the values in Table 3 of the Data Notebook.

Deception exercise

1. Examine the section of the recording that contains the subject's negative responses during the deception exercise.
2. Determine the skin temperature, skin conductance and heart rate ten seconds before and ten seconds after each card was shown, as indicated by the comment.
3. Record these values for each card in Table 4a.
4. Repeat this procedure for the positive responses and the "no response" sections of the recording. Record the data for positive responses in Table 4b, and the "no response" values in Table 4c.
5. Calculate the change in skin temperature, skin conductance, and heart rate after the card was shown and the question asked.
6. Attempt to determine which card was chosen, based on the results.
7. Record the actual card chosen in the Data Notebook.

Table 1: Skin conductance and the startle response.

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Stimulus event	Change in skin conductance after stimulus (μs)	Latency (s)
1	4.57	1.4

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Stimulus event	Change in skin conductance after stimulus (μs)	Latency (s)
1	1.27	0.85

There was only one stimuli so there wasn't enough data to calculate the average.

Table 2: Skin conductance and skin temperature in response to mild stress.

Amin

Baseline Values		Stress		Recovery	
Skin conductance (μs)	Skin temperature (°C)	Skin conductance (μs)	Skin temperature (°C)	Skin conductance (μs)	Skin temperature (°C)
-0.0114	30.469	4.5305	30.5384	1.1152	30.6255
		5.5595	30.5537		
		5.1044	30.5665		
		4.1689	30.5847		
		3.69	30.6085		
		3.0757	30.5929		
		2.8748	30.5603		
		2.3578	30.5767		

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Baseline Values		Stress		Recovery	
Skin conductance (μs)	Skin temperature (°C)	Skin conductance (μs)	Skin temperature (°C)	Skin conductance (μs)	Skin temperature (°C)
1.1838	34.245	1.6455	34.2586	0.2461	34.3616
		1.4469	34.2586		
		1.0242	34.2665		
		1.4584	34.2925		
		1.8335	34.3096		
		1.4575	34.3355		
		1.0171	34.356		

Table 3. Baseline data for the lie detector experiment

Amin

Question#	Response (+/-)	Skin conductance (μ s)			Skin temperature ($^{\circ}$ C)		
		Before question	After question	Difference	Before question	After question	difference
1	-	-0.17	3.89	4.06	31.92	31.95	0.03
2	+	3.11	3.87	0.76	31.96	31.98	0.02
3	+	2.06	4.23	2.17	32	32.04	0.04
4	-	3.25	4.76	1.51	32.05	32.06	0.01
5	+	3.75	5.95	2.2	32.06	32.07	0.01
6	+	4.53	4.95	0.42	32.08	32.09	0.01
7	-	3.87	5.64	1.77	32.10	32.11	0.01
8	+	3.96	4.66	0.7	32.13	32.13	0
9	-	3.57	5.48	1.91	32.16	32.17	0.01
10	-	4.02	5.32	1.3	32.19	32.21	0.02

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Question#	Response (+/-)	Skin conductance (μ s)			Skin temperature ($^{\circ}$ C)		
		Before question	After question	difference	Before question	After question	difference
1	-	-0.58	0.38	0.96	34.81	34.81	0
2	-	0.19	0.12	-0.07	34.81	34.81	0
3	+	0.03	0.06	0.03	34.81	34.81	0
4	-	-0.25	0.09	0.34	34.81	34.81	0
5	-	-0.03	-0.22	-0.19	34.81	34.81	0
6	+	-0.34	-0.50	-0.16	34.81	34.82	0.01
7	-	-0.49	-0.64	-0.15	34.82	34.82	0
8	-	-0.51	-0.58	-0.07	34.82	34.80	-0.02
9	-	-0.72	-0.84	-0.12	34.80	34.79	-0.01
10	-	-0.74	-0.20	0.54	34.80	34.78	-0.02

Table 4a. Results from the lie detector experiment when the volunteer gave only negative responses

Amin

card	Skin conductance (μs)			Skin temperature ($^{\circ}\text{C}$)		
	Before question	After question	difference	Before question	After question	difference
9y	-2.39	1.24	3.63	32.67	32.66	-0.01
1g	0.51	-1.44	-1.95	32.66	32.67	0.01
5b	-2.07	-2.40	-0.33	32.67	32.67	0
7r	-2.54	-2.40	0.14	32.66	32.67	0.01
6g	-2.67	-2.89	-0.22	32.67	32.67	0
2y	-3.08	-3.26	-0.18	32.67	32.67	0
4r	-3.39	-3.54	-0.15	32.67	32.66	-0.01
3b	-3.70	-3.91	-0.21	32.66	32.66	0

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card	Skin conductance (μs)			Skin temperature ($^{\circ}\text{C}$)		
	Before question	After question	difference	Before question	After question	difference
9y	1	1.12	0.12	34.66	34.66	0
1g	1.4	1.18	-0.22	34.66	34.66	0
7r	1.05	0.88	-0.17	34.66	34.68	0.02
5b	0.78	1.25	0.47	34.67	34.67	0
2y	1.03	0.89	-0.14	34.67	34.67	0
4r	0.86	1.21	0.35	34.67	34.67	0
3b	1.20	1.15	-0.05	34.67	34.67	0
6g	0.96	0.84	-0.12	34.67	34.67	0

Table 4b. Results from the lie detector experiment when the volunteer gave only positive responses

Amin

card	Skin conductance (μs)			Skin temperature ($^{\circ}\text{C}$)		
	Before question	After question	difference	Before question	After question	difference
7r	-4.54	-3.61	0.93	32.63	32.62	-0.01
5b	-3.58	-4.15	-0.57	32.61	32.60	-0.01
1g	-4.32	-4.50	-0.18	32.60	32.59	-0.01
9y	-4.71	-4.81	-0.1	32.58	32.58	0
3b	-4.96	-0.76	4.2	32.57	32.57	0
4r	-3.22	-3.88	-0.66	32.56	32.56	0
2y	-4.21	-4.39	-0.18	32.55	32.55	0
6g	-4.55	-4.57	-0.02	32.55	32.55	0

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card	Skin conductance (μs)			Skin temperature ($^{\circ}\text{C}$)		
	Before question	After question	difference	Before question	After question	difference
5b	0.99	1.24	0.25	34.69	34.68	-0.01
7r	1.77	0.67	-1.1	34.68	34.68	0
6g	.56	1.48	0.92	34.68	34.68	0
2y	1.67	1.46	-0.21	34.68	34.69	0.01
4r	1.54	1.76	0.22	34.68	34.69	0.01
3b	1.49	1.37	-0.12	34.70	34.70	0
1g	1.57	1.35	-0.22	34.70	34.71	0.01
9y	1.22	1.19	-0.03	34.71	34.71	0

Table 4c. Results from the lie detector experiment when the volunteer gave no response.

Amin

card	Skin conductance (μs)			Skin temperature ($^{\circ}\text{C}$)		
	Before question	After question	difference	Before question	After question	difference
7r	-4.74	-4.53	0.21	32.57	32.57	0
1g	-4.66	-5	-0.34	32.56	32.56	0
4r	-5.17	-5.22	-0.05	32.56	32.56	0
2y	-5.33	-5.39	-0.06	32.56	32.55	-0.01
6g	-5.40	-5.46	-0.06	32.55	32.55	0
5b	-5.43	-5.61	-0.18	32.54	32.54	0
3b	-5.69	-5.73	-0.04	32.53	32.53	0
9y	-5.79	-5.83	-0.04	32.52	32.52	0

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card	Skin conductance (μs)			Skin temperature ($^{\circ}\text{C}$)		
	Before question	After question	difference	Before question	After question	difference
2y	0.96	0.92	-0.04	34.73	34.73	0
6g	1.10	1.54	0.44	34.74	34.74	0
7r	1.43	1.20	-0.23	34.74	34.74	0
5b	1.04	0.96	-0.08	34.74	34.74	0
9y	0.96	0.89	-0.07	34.74	34.74	0
1g	0.84	1.11	0.27	34.73	34.72	-0.01
3b	0.71	0.61	-0.01	34.72	34.72	0
4r	0.47	0.73	0.26	34.72	34.72	0

Table 5. Predictions from the deception exercise.

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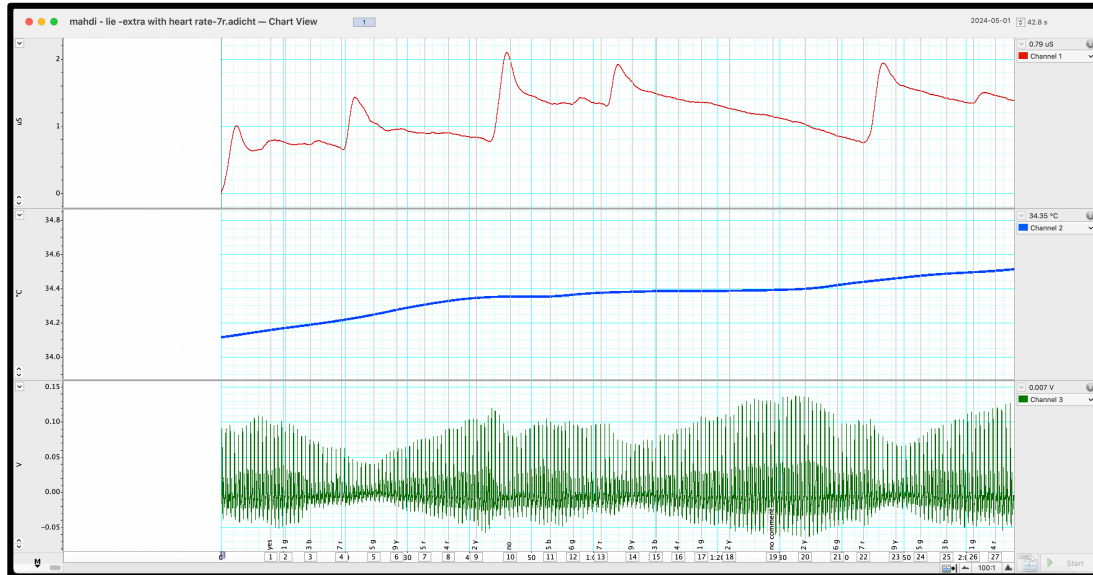
Predicted card	Actual card
9y	9y

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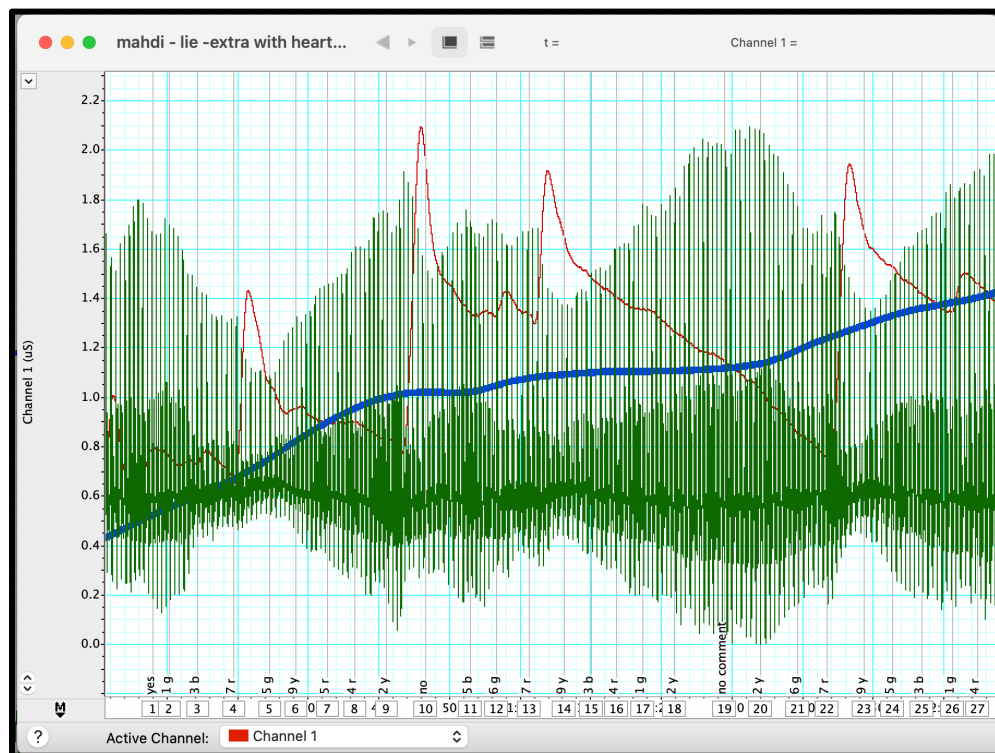
Predicted card	Actual card
7r	4r

Extra:

An extra part of the lie detector test was using the ECG signal which is more resolutionized than the body temperature signal.



The chosen card was 7r and as we can see the heart rate drops on the 7r.



Here is the combined signal, as we can see it is easier to detect if the volunteer is lying or not using the ECG signal.