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Maps of electrical activity in diabetic patients and normal individuals



Constantin Ionescu-Tirgoviste^{a,c,1}, Paul A. Gagniuc^{a,b,c,*,1},
Elvira Gagniuc^d

^a National Institute of Diabetes, Nutrition and Metabolic Diseases “N.C. Paulescu”, Bucharest, Romania

^b Faculty of Engineering in Foreign Languages, Politehnica University of Bucharest, Romania

^c Center of Excellence in Translational Medicine, Fundeni, Romania

^d University of Agronomic Sciences and Veterinary Medicine, Faculty of Veterinary Medicine, Bucharest, Romania

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ABSTRACT

Here, data related to the electrical activity of the human skin are presented in detail. The 3D electrical activity maps in normal and diabetic individuals are shown and described using raw data obtained with *Photon-Pixel coupling*. Average electrical activity matrices are shown by subject, gender and group. Distributions of the electrical activity data are shown in connection with the ventral and dorsal side of the human torso. For a better understanding of the electrical activity data, critical parameters of the individuals that participated in the study are also presented.

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Specifications table

Subject area	<i>Biology, medicine</i>
More specific subject area	<i>Bio-signals</i>
Type of data	<i>Table, image, text file, graph, figure.</i>
How data was acquired	<i>Prototype system for parallel sampling of electrical signals.</i>

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* Corresponding author.

E-mail addresses: paul_gagniuc@acad.ro, cit@paulescu.ro (P.A. Gagniuc).

¹ Co-first authors.

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Data format	Raw, filtered, analyzed.
Experimental factors	Brief description of any pretreatment of samples
Experimental features	A collection of 200 sensors have been located across the entire trunk surface. The output of each sensor was remotely inserted in a 20×10 LED matrix for a parallel capture of the signals. Continuous observations of the electrical activity pattern were made above the LED matrix by a digital camera in an obscure environment. A total of 5.2 million measurements (25920 maps) have been recorded as light intensities from the LED matrix and converted into percentages for evaluation. A total of 36 individuals have been divided equally into two groups and subjected to a short glucose tolerance test for 1 hour; one group with established Type 2 Diabetes (T2D) and the other group without diabetes.
Data source location	Electrophysiology Laboratory, N.C. Paulescu Institute, Bucharest, Romania.
Data accessibility	All data is within this article.
Related research article	Constantin IONESCU-TIRGOVISTE, Paul A. GAGNIUC, Elvira Gagniuic. The electrical activity map of the human skin indicates strong differences between normal and diabetic individuals: A gateway to onset prevention. <i>Biosensors and Bioelectronics</i> , 120 (2018) 188–194.

Value of the data

- Differences in the electrical activity of individuals may help in the prediction of diabetes.
 - The raw data of the average electrical activity matrices may reveal new findings.
 - Observations and correlations with other types of medical data can reveal new insights.
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1. Data

1.1. Data acquisition setup

Our approach was related to the electrical activity of the skin in normal and disease conditions [1]. *Photon-Pixel coupling* was used for direct observations on the subtle metabolic processes of 36 individuals: 18 normal subjects and 18 diabetics subjects [2]. A collection of 200 sensors were located across the entire trunk surface. The amplified electrical signals were transported by wire to an LED matrix. The LEDs of the sensors from the dorsal side were associated with the first half of the encoded matrix. In contrast, the sensor LEDs from the ventral side were positioned on the second half of the encoded matrix. The light signals of the LEDs were translated into pixel values an percentages. Thus, the brightness of individual LEDs was the main signal, with values between 0% and 100%.

1.2. Meaning of the data

We have divided a series of approaches to analyze the LED matrix. The left side of the LED matrix reflects the dorsal side of the torso (back) and the right side of the LED matrix reflects the ventral side of the torso (front). The relationship between diabetic and non-diabetic patterns has been carefully studied in terms of average values of luminosity. We divided the two groups by gender: normal females (F-), diabetic females (F+), normal males (M-) and diabetic males (M+). A total of 5.2 million measurements have been organized in 25,920 encoded maps. The normal group consisted of 12,960 matrices (3600 matrices for F- and 9360 matrices for M-) and the diabetic group consisted of 12,960 matrices (5760 matrices for F+ and 7200 matrices for M+). An average was made across the matrix elements of each group. Thus, one average matrix was obtained for each gender in the two groups

Table 1
The main parameters for the normal and diabetic group.

No.	Age (years)	Height (cm)	Weight (kg)	Gender	Glycemic value mg/dL (t0)	Glycemic value mg/dL (t1)	Glycemic value mg/dL (t2)	Glycemic value mg/dL (t3)	Glycemic value mg/dL (t4)	Time past since the onset (years)	Diabetic/Normal	Mean Blood glucose level (mg/dL)	Until the onset (months)	Time past since the onset (months)
1	59	156	92	F(+)	263	483	329	408	489	0,4	D	394,4	703	5
2	67	170	100	F(+)	163	228	270	284	359	4,0	D	260,8	756	48
3	58	150	68	F(+)	116	150	327	346	355	0,1	D	258,8	695	1
4	77	163	78	F(+)	285	297	307	344	350	8,0	D	316,6	828	96
5	61	151	70	F(+)	148	181	240	336	344	0,1	D	249,8	731	1
6	56	161	97	F(+)	170	187	240	322	333	3,0	D	250,4	636	36
7	78	141	58	F(+)	111	146	196	244	267	5,0	D	192,8	876	60
8	72	160	72	F(+)	157	198	171	183	210	2,0	D	183,8	840	24
9	54	182	150	F(-)	100	150	192	243	239	0	N	184,8	648	
10	41	155	56	F(-)	119	198	232	272	235	0	N	211,2	492	
11	66	165	60	F(-)	216	150	190	220	199	0	N	195	792	
12	70	163	80	F(-)	92	157	179	207	190	0	N	165	840	
13	32	160	72	F(-)	106	128	145	183	177	0	N	147,8	384	
14	57	175	98	M(+)	262	281	332	386	433	8	D	338,8	588	96
15	51	180	118	M(+)	254	300	293	343	407	17	D	319,4	408	204
16	54	165	78	M(+)	181	240	343	354	398	15	D	303,2	468	180
17	59	170	78	M(+)	246	267	330	366	392	6	D	320,2	636	72
18	76	164	67	M(+)	126	166	196	248	299	3	D	207	876	36
19	63	186	85	M(+)	158	193	284	264	290	2	D	237,8	732	24
20	69	173	117	M(+)	217	227	278	253	281	8	D	251,2	732	96
21	63	183	97	M(+)	114	153	175	207	238	2	D	177,4	732	24
22	72	168	84	M(+)	148	140	172	203	232	5	D	179	804	60
23	75	169	75	M(+)	117	160	193	226	219	6	D	183	828	72
24	49	176	79	M(-)	133	173	213	271	264	0	N	210,8	588	
25	71	175	95	M(-)	110	158	151	223	222	0	N	172,8	852	
26	56	183	100	M(-)	109	127	184	246	209	0	N	175	672	
27	61	166	98	M(-)	103	117	158	180	195	0	N	150,6	732	
28	25	165	102	M(-)	91	141	172	169	194	0	N	153,4	300	
29	35	180	81	M(-)	107	127	146	167	184	0	N	146,2	420	
30	26	188	88	M(-)	100	133	200	209	170	0	N	162,4	312	
31	24	187	87	M(-)	110	130	144	157	163	0	N	140,8	288	
32	33	193	95	M(-)	92	138	202	152	154	0	N	147,6	396	
33	17	188	70	M(-)	89	129	140	171	150	0	N	135,8	204	
34	24	191	71	M(-)	104	115	140	130	109	0	N	119,6	288	
35	38	192	97	M(-)	94	128	154	189	109	0	N	134,8	456	
36	27	175	72	M(-)	98	98	98	99	98	0	N	98,2	324	

Table 2

Glycated hemoglobin (HbA1C) values for all 36 subjects.

No.	Name (MD5)	HbA1C (%)
1	bf2be9b80589d7f8e5e7d5cc93e53062	8,84
2	04e6d612a88913bf1418df6e8242c24b	7,55
3	e7a6ab6b406467de0bf40d72f65ed7bb	7,82
4	c65f0bf3de105c104052d8de6ae47015	7,3
5	be89577f6318a2ff2915fbb813183f7c	7,14
6	589114d05e15e7c5a0e5be71d1c98d1a	8,93
7	9ee2a56f752c365cf0fb69e5c3adb8a3	7,3
8	b0fd983d9f7cdb67048b32b3b63aa677	8,12
9	eda4c01af3590ba8e5117e207c4b5ee6	5,6
10	4c73e7b7f9bca8d78f6a78fa1efff230	5,5
11	53c1f61cbd086bb6c8556dc473e2cb5b	5,8
12	b48e10451752d684060e6bf97403ae89	5,3
13	a99146932cd5da99bcaa0879bcd2d33e	5,7
14	492399db88e52450b4832515c696ea94	8,17
15	7b9ab472f742b2ff02846cbc1264eb7e	7,81
16	29d5b27b67bf9a02b58b6f6a4ac2ecea	9,25
17	65e348c918b3546397abc6a60dd0372d	7,56
18	2e18afa28f50026059f4c59673018f7a	7,56
19	2a2676af16a3a36f0b6e3c78073c0210	7,94
20	5dc883b4f68cdd5255acf454381c30c0	8,23
21	b7210655db1de3818d8d7f969a3c00dc	7,17
22	c0be7e67be9b45b1d555f92923020e0b	7,46
23	6cd80ce82d4ec46ade7b701235c57586	6,5
24	ed25b8dcf92b4c379c8e97d10690658e	5,4
25	884c28b823a90a50d7a3fdd6cdc34ecd	5,7
26	212cfc7bf03ddbe7b36a9c6fd5a7898b	5,8
27	afb76e85b5a61fd4693a8e2146650109	5,3
28	5950e85ebc917666f3288e315a1cf2fd	4,9
29	110cd4fe212c5b8a50c1ebf41de16281	5,5
30	e98ede973f459ad1dd80716d2c3fd190	5,6
31	17104ee9882a961b54d62994c0cd96ca	5,4
32	037d3eb7e7baa8bbdf0b980f3a6f0a39	5,3
33	449dc79877e74253a6e6024c072d13c7	5,3
34	2079ed58e3565dcf1afe43848167f880	5,9
35	f8cab4fd79a594ee190fecc49b2ae998	5,4
36	7bd6dd5e2021961803fb5e83ac86cc7a	5,2

(F-,M-,F+,M+). By using these average matrices, normal females were compared with diabetic females (F-,F+) and non-diabetic males were compared to diabetic males (M-,M+). This comparison was made on several criteria: 1) average signals on rows; 2) average signals on columns, 3) average signals on back rows; 4) average signals on front rows; 5) average signals on back columns; 6) average signals on front columns. To obtain the 2D and 3D maps of the electrical activity, global matrices from diabetic and non-diabetic groups were decoded (rearranged) according to the actual positions of the sensors on the surface of the torso.

Data below shows to the main parameters of the human subjects that participated in the experiment: age, height, weight, gender, time since onset, Diabetic/ Normal, mean blood glucose level (Table 1). Glycemic values from the table below originate from a short glucose tolerance test (Supplementary material 1). Each participant in the 1h experiment was carefully monitored for blood glucose levels in milligrams per deciliter (mg/dL) at 15-min intervals noted as t_0 (0 min), t_1 (15 min), t_2 (30 min), t_3 (45 min) and t_4 (60 min).

Glycated hemoglobin (HbA1C) values for all 36 subjects have also been recorded (Table 2). Glycated hemoglobin values represent the mean of blood glucose values for a previous period of 3-4 months, indicating the metabolic balance over time. The diabetic group included individuals with HbA1C values above the 6.5% threshold whereas individuals with values below 5.9% were associated with the normal group.

1.3. Glycemic data in a short blood glucose tolerance test

The data below shows the glycemic distribution in 36 subjects, measured at 15-minute intervals for one hour. Subjects are sorted at each interval ($t_1 . t_4$) depending on the following labels: "1" (dark brown box) and "0" (white box). Where "1" specifies patients with diabetes and "0" specifies healthy individuals. Bright red cells show a maximum blood sugar of 489 mg/dL and dark green shows a minimum glycemic value of 89 mg/dL (Table 3).

The means (AV) and standard deviations (SD) are shown for all intervals ($t_1 . t_4$) at the bottom of the table. A graphic representation of AV and SD is found in the graph below (Fig. 1).

The chart above shows the average glycemic values of the two groups as a whole and how these two groups collectively behaved in each $t_1...t_4$ intervals. The chart below shows the AV and SD of the glycemic values ($t_1...t_4$ intervals) in each subject (Fig. 2). The left side of the chart corresponds to the first subject in the top of the table (first line – a diabetic individual with the highest average blood glucose level) and the association continues to descend until it reaches the last individual in the table (the normal individual with the lowest and most stable average glycemic value).

The data below shows a breakdown of raw glycemic values by gender. Bright red cells show a maximum blood sugar of 489 mg/dL and dark green shows a minimum glycemic value of 89 mg/dL. The means (AV) and standard deviations (SD) are shown at the bottom of the table. The representation of SD and AV is found in a graph below each table. The means (AV) and standard deviations (SD) are shown for all intervals ($t_1...t_4$) at the bottom of the table. A graphic representation of AV and SD is found in the graph below each table. Thus, the chart associated with each table shows the behavior of the glycemic values in $t_1...t_4$ intervals by gender. The set of tables and graphs below shows the average glycemic behavior in diabetic and normal females (Table 4).

The set of tables and graphs below shows the average glycemic behavior in diabetic and normal males (Table 5).

Data above shows the gender behavior in each group in the case of a short blood glucose tolerance test over a period of 1 h, in which 37 g of glucose was given to each subject at 15 min and 30 min

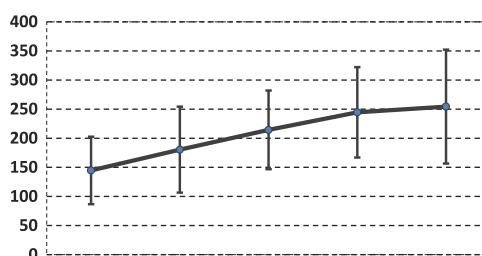


Fig. 1. The mean glycemic values for $t_1 . t_4$ intervals across 36 subjects.

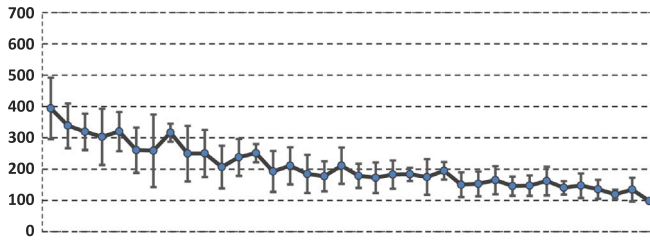


Fig. 2. The mean glycemic value / subject ordered from the largest to the smallest mean value.

Table 4

The behavior of the glycemic values in t1... t4 intervals in females.

F(+) Diabetic Females						F(-) Normal Females					
	t0	t1	t2	t3	t4		t0	t1	t2	t3	t4
	263	483	329	408	489		100	150	192	243	239
	163	228	270	284	359		119	198	232	272	235
	116	150	327	346	355		216	150	190	220	199
	285	297	307	344	350		92	157	179	207	190
	148	181	240	336	344		106	128	145	183	177
	170	187	240	322	333	AV	127	157	188	225	208
	111	146	196	244	267	SD	51	26	31	34	28
	157	198	171	183	210						
AV	177	234	260	308	338						
SD	64	112	59	70	80						

AV = Average
SD = Standard deviation

Table 5
The behavior of the glycemic values in t1...t4 intervals in males.

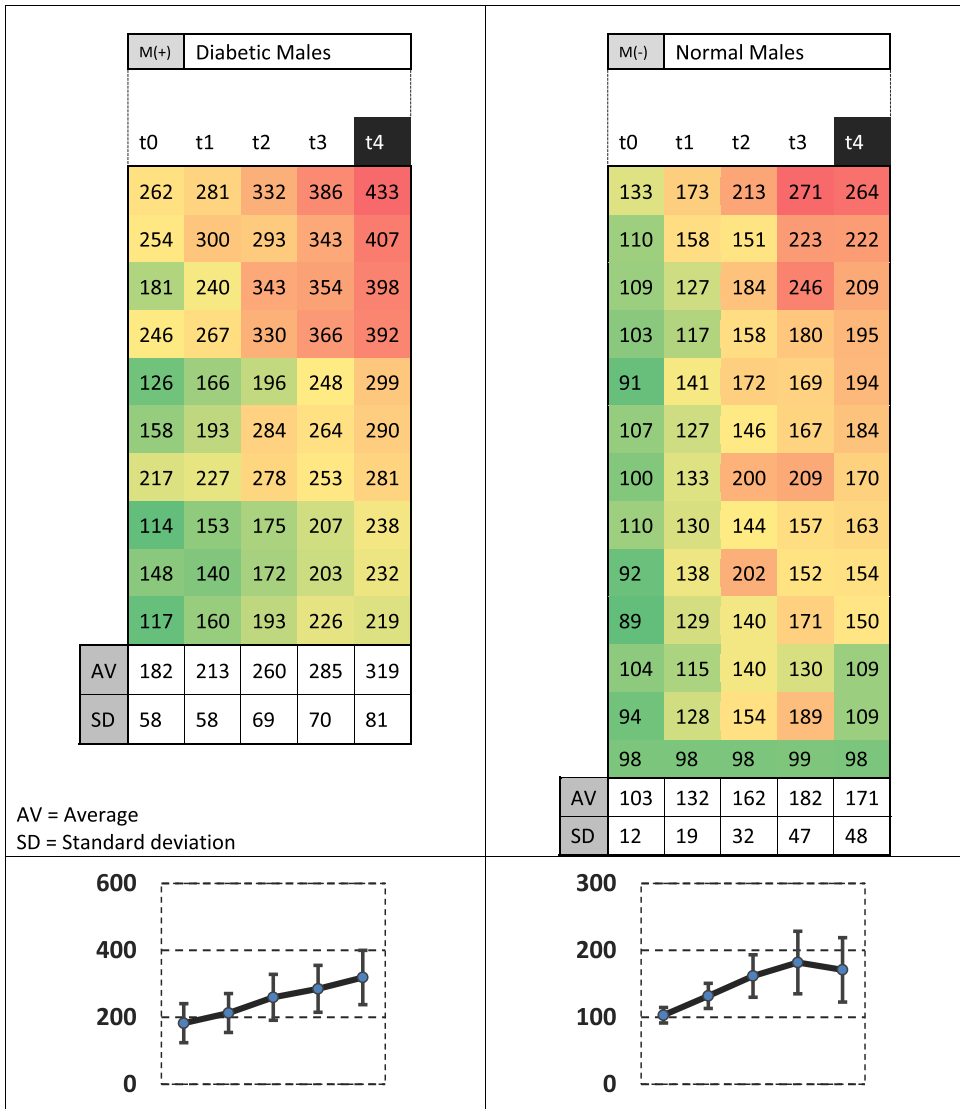


Table 6
Total measurements in normal and diabetic individuals by gender.

Groups	Normal		Diabetics	
Gender	F-	M-	F+	M+
Number of matrices	3600 matrices	9360 matrices	5760 matrices	7200 matrices
Number of measurements	0.7 million	1.9 million	1.2 million	1.4 million

(usually such a test lasts 2 h). The data can be useful in clinical practice and in various research on the topic of Type 2 diabetes.

2. Electrical activity matrices of 36 subjects

The table below shows the gender distribution on 5.2 million measurements of electrical signals (25,920 matrices) from normal and diabetic individuals (Table 6). The minus sign (–) denotes the normal group and the plus sign (+) denotes the diabetic group.

Each matrix below is an average made across 720 raw matrices sampled at 5 minute intervals for 1h. Each matrix has a total of 200 elements which contain percentages from 0% to 100%. The following matrices show the average signals in each of the 36 subjects (Supplementary material 2). The images of the 36 matrices were further used for prediction using TensorFlow (Supplementary material 3). Thus, normal females (F-) are represented by 5 subjects as follows:

Normal Females (F-)

3	3,4	4,2	5,8	4,3	2,3	11	4,6	5,3	7,5	7,9	11	5,4	4,2	25	3,9	7,9	2,9	2,8	2,4
2,6	2,2	2,5	6,6	6,7	2,2	2,6	6	7,7	4,5	2,5	3,3	5,3	10	6	4,3	3,9	9,6	1,9	2,3
7,3	2,8	3,2	3,1	3	2,8	2,5	3,9	5,7	1,1	2,4	1,1	2,0	1,1	3,4	1,7	2,3	1,5	7	4,3
4,2	8,8	5,3	7,7	7,4	2,8	3,3	4,1	6,1	1,0	1,6	6,5	4,4	3,1	3,1	2,8	1,8	2,5	5,5	2,7
2,5	7,4	7,3	2,3	2,4	3,3	3,9	8,7	2,0	6,8	1,5	6,5	6,3	4,8	3,3	3,4	1,3	5,5	4,5	6
2,9	3,8	2,9	2,9	3,9	4,2	4,2	3,2	7,5	5,7	9,1	9,2	3,7	3,0	1,3	6,7	4,1	5	4	5,1
2,1	2,6	2,6	3,7	4,6	2,1	1,8	5,9	5	4,4	1,1	1,6	5,8	2,3	1,7	1,8	7,2	1,2	4,1	3,3
4,6	3,7	1,0	2,7	3,7	8,4	6,2	5,8	3,2	1,3	5,7	1,7	1,1	7,7	2,0	3,4	1,3	3,4	1,9	1,3
4,7	2,6	3,8	3,4	6,5	3,5	3,4	2,6	2,6	4,1	7,5	1,7	1,2	1,6	3,2	7,5	1,4	1,5	9,9	1,7
3	1,3	7,4	2,9	2,3	2,5	2,2	2,7	2,3	4	1,4	1,3	1,4	2,7	1,3	1,3	3,1	7,7	1,9	2,3

F(-) encoded average matrix of subject 1

8,7	1,8	7,1	5,8	5,1	6,6	1,0	9,9	5,6	3,0	2,0	1,2	8,1	4,7	4,0	2,3	3,7	3,1	2,7	2,1
2,4	2,4	8,7	2,8	3,2	2,6	6,8	7,4	2,0	1,0	7,6	2,3	3,5	6,7	8,8	7,1	4,4	1,2	1,1	6,3
3,4	5,5	6,8	7,9	8,9	1,4	1,6	1,8	8,1	6	1,3	8,3	1,1	9,4	3,2	2,5	2,5	1,0	7,8	6,1
4,1	7,7	5,5	2,1	3,0	9,2	6,5	5,9	5	5,9	6,4	4,1	3,6	3,2	5,2	3,8	1,5	1,0	9	3,3
1,8	3	5,1	3,9	4	4,6	4,1	6,1	6	6,4	1,2	3,5	4,6	2,9	2,5	1,7	9,7	5	4,3	2,3
2,6	3,3	3,2	3,8	4,1	3,2	3,5	1,2	1,0	5,2	3,6	2,0	2,1	3,1	5,8	3,7	5	3,4	3,3	3,8
2,5	4	2,5	3,4	3,9	3,9	7,2	9,3	1,6	1,1	8,3	1,9	8,1	1,9	1,2	8,2	5,2	7,5	1,7	1,5
9,8	1,5	5,9	1,5	3,6	8,4	4,5	4,9	9,2	7	3,8	1,5	1,2	8,6	2,3	3,3	1,0	4,1	8,1	6
8,6	7,0	1,4	4,5	7,7	5,1	3,8	3,1	2,9	7,4	1,7	2,3	1,9	9,6	3,6	9,3	6,8	1,2	8	2,0
7,7	9,4	4,1	4	3,9	3,8	3,2	5,2	3,6	4,1	2,8	6,8	1,0	2,2	1,4	7	1,5	5	1,2	2,8

F(-) encoded average matrix of subject 2

11	54	97	65	25	4,2	6,7	17	21	3,4	4,5	12	91	24	9,1	2,9	47	4,4	2,7	2
5,8	10	28	19	13	4,7	3	7,3	9,3	3,8	6	9,6	66	51	8,3	4	4,1	8,1	32	13
40	65	51	49	12	4	2,9	4	3,3	3,5	84	38	16	14	36	22	39	12	3,5	24
38	52	39	25	20	6,5	9,1	4,9	16	10	9,9	62	37	58	41	37	11	16	8,5	16
47	44	24	8,8	5,7	5,1	3,6	24	34	85	47	46	49	32	22	23	9,6	4,2	17	12
15	29	13	13	13	3,9	4	41	44	25	52	36	12	11	9,9	8	4,8	3,9	4,1	4,4
3	6,1	3,8	4,6	4,5	4,3	5,1	24	24	10	35	21	52	25	11	8,9	4,4	11	40	28
2,4	2,5	2,2	4	14	16	7,2	11	44	22	21	7,3	6,8	5,6	13	26	12	32	16	18
2	2	4,1	7,5	7,8	19	33	12	9,7	30	54	17	7,3	7,9	25	6,1	12	14	5,2	5,6
6,8	8,9	2,4	4,4	5,7	84	82	28	6,2	3,6	5,7	5,8	7,1	20	12	15	21	7,4	7,1	14

F(-) encoded average matrix of subject 3

6,5	2,8	45	87	52	3,2	15	93	70	4,6	19	7,6	13	7,4	22	2,3	2,3	1,9	2	1,8
2,5	2,9	5,5	6,6	15	3,5	4,5	19	4,3	5,3	12	98	99	51	4,3	2,6	2,9	15	12	4,6
43	99	36	16	3,1	3,1	2,8	4,9	5,1	5	43	68	95	8,9	59	64	32	3,3	3,3	2,7
10	62	62	8	4	2,7	5	10	84	22	82	94	81	71	19	9,5	4,9	7	45	90
2,7	3,4	5,7	3,5	3,8	5	26	82	96	98	98	80	67	48	61	44	71	3,7	4,7	11
3,2	3,3	4,1	29	7,3	10	98	100	65	26	94	29	79	24	8,5	7,7	4,5	4,4	3	3,3
8,5	14	19	50	98	49	72	38	31	12	83	93	90	23	86	84	6,6	69	52	31
86	73	71	97	100	68	46	81	24	10	24	59	11	12	79	88	82	45	9,6	23
58	15	9,8	18	36	17	64	16	38	92	36	88	14	44	56	6,3	5,2	18	7	31
6	4,1	4,6	43	4,3	49	90	86	67	42	4,8	15	10	6,9	3,6	3,5	3,7	18	8,6	92

F(-) encoded average matrix of subject 4

23	40	71	99	89	100	100	99	99	99	73	71	99	46	62	9,1	29	7,6	11	3,4
12	22	52	69	75	77	92	86	65	60	58	74	68	34	18	32	11	19	28	29
11	33	36	69	64	59	59	61	43	36	56	48	43	39	81	53	61	47	11	27
35	55	41	50	53	43	56	38	40	27	39	64	84	100	99	99	100	84	57	25
18	19	23	27	29	29	28	23	21	33	45	100	94	99	95	97	74	19	19	13
15	20	21	29	25	23	19	31	25	25	100	98	98	97	92	45	16	15	22	32
21	38	58	32	32	40	42	22	29	28	99	84	88	62	53	36	18	48	80	81
62	67	49	35	38	52	36	46	61	55	35	77	29	34	37	59	58	49	89	80
98	94	56	49	49	34	51	59	48	74	60	35	23	28	33	18	33	29	46	18
35	45	54	57	39	43	59	98	67	99	75	32	25	59	18	24	8,4	16	16	8,9

F(-) encoded average matrix of subject 5

Diabetic Females (F+) are represented by 8 subjects as follows:

Diabetic Females (F+)

58	67	85	97	100	99	98	99	99	99	99	90	86	92	100	97	91	98	99	99
44	75	99	99	99	100	97	99	99	94	92	99	100	96	99	100	100	90	93	87
98	100	96	96	97	99	98	96	92	90	97	99	99	98	98	93	77	71	99	95
98	97	97	98	89	91	78	82	83	93	98	96	84	86	98	99	94	70	98	98
57	71	84	76	69	76	78	86	92	98	98	94	98	95	86	98	99	77	98	94
17	36	56	68	91	93	99	98	98	99	99	85	86	93	77	92	91	99	99	78
33	58	89	98	99	98	99	98	98	99	95	100	90	97	90	98	95	99	100	75
99	95	100	99	97	97	98	97	93	87	86	85	89	81	86	67	86	99	85	44
100	100	99	95	83	91	100	97	98	98	98	99	96	96	92	83	75	80	76	55
29	47	85	98	81	91	97	98	98	98	99	99	99	97	91	97	83	83	99	97

F(+) encoded average matrix of subject 1

4,5	7	4,5	37	34	23	79	50	75	41	8,7	13	86	21	33	5,1	15	47	4,2	2
3,5	3,6	5,3	15	17	9,3	15	16	7,4	5,6	12	80	81	48	9,9	4,5	3,4	5,9	27	7
55	42	10	12	6,9	4,1	3,9	5,2	4,6	4,4	16	22	30	14	29	22	33	9,9	3,2	7,4
8,8	38	25	8	4	3,3	6,8	14	50	14	13	6,9	18	13	13	11	4,9	4,3	7,1	34
2,2	3,1	4,5	3,7	8,7	21	15	42	24	28	17	23	14	5	5,3	11	3,6	3,4	3,1	2,3
2,6	2,8	4,3	17	21	12	25	50	37	17	9,3	18	9,4	16	17	7,4	6	13	3,4	3,7
2,6	5,3	21	13	22	45	85	70	42	10	13	11	44	28	23	28	7	24	24	10
7,6	16	35	59	82	64	56	42	23	9,8	20	42	16	8,1	20	47	22	33	5,3	6,6
69	43	13	13	31	18	13	8,7	7,4	17	10	15	16	16	36	8,1	15	17	11	22
7,2	10	3,8	4,1	3,7	4,3	4,1	39	14	30	15	5	8,7	10	5,7	6,8	20	15	33	44

F(+) encoded average matrix of subject 2

9,8	13	36	15	8,5	16	14	3	42	23	7,4	8	14	5,9	3,2	2,9	64	22	16	1,1
3	1,4	4,4	7,5	5,5	4,5	4,1	6,1	4	3,9	9,7	22	82	35	11	24	9,4	7,9	9,8	15
2,6	3,6	3,9	6	5,2	3,6	2,7	3,7	2,6	2,9	31	11	14	12	12	12	20	16	3,3	17
2,6	58	40	21	9	3,2	3,5	3	4,2	4,4	7,3	60	53	57	65	35	25	17	6,2	6,8
21	13	8	4,4	5,5	9,2	11	45	6,8	4,7	32	57	60	69	39	34	13	6,7	3,7	4,3
4,9	5,5	4,3	7,1	10	86	43	9,7	14	12	60	90	36	73	81	46	54	66	3,8	3,9
2,8	4,1	5,1	9,1	66	81	29	22	24	14	48	21	36	21	26	19	10	25	54	30
8,6	18	31	52	75	50	39	48	54	24	8,9	17	7,8	7,9	25	52	24	42	12	7,4
68	42	16	23	38	23	12	12	10	7,9	5,5	6,6	6,9	13	26	11	19	14	6,1	7,5
21	23	5,2	5,3	6,9	12	14	57	14	23	14	5,5	8,7	12	6,7	8,8	15	12	13	9

F(+) encoded average matrix of subject 3

100	99	77	65	62	37	37	73	98	89	97	99	100	99	100	36	27	28	57	46
42	53	82	78	70	79	76	83	95	94	100	99	91	82	69	94	74	88	96	86
67	72	72	79	83	100	100	96	88	100	81	77	98	95	88	99	86	90	98	100
72	100	92	68	86	99	99	99	97	93	71	70	60	73	100	79	90	95	91	55
8,1	24	37	51	99	92	100	99	95	99	79	100	100	41	24	56	99	74	54	28
8,1	35	46	67	81	82	90	100	97	89	99	99	67	35	28	96	48	37	63	18
66	64	79	86	86	93	84	87	87	62	61	99	75	85	85	41	19	24	91	53
40	39	81	52	81	98	62	60	57	97	48	21	14	16	11	5	5,3	28	100	100
24	54	57	67	55	59	60	100	87	80	53	62	57	49	34	28	57	33	37	33
0,6	3,8	11	90	85	78	77	47	19	44	14	4,6	63	98	81	76	96	100	93	80

F(+) encoded average matrix of subject 4

90	95	46	49	51	13	59	68	71	65	12	1,5	8,5	39	16	24	28	9	16	54
22	11	35	27	18	66	61	68	88	96	27	26	23	23	41	90	82	27	18	35
43	54	43	69	48	47	34	60	96	98	61	98	85	84	71	99	98	70	66	27
87	81	62	14	20	50	99	98	77	94	87	99	99	61	94	99	95	27	8,9	2,3
2,4	5,2	8,8	19	52	45	60	71	76	99	98	99	97	99	87	91	86	9,6	13	2,2
1,5	55	15	22	80	45	59	92	100	100	97	98	77	54	46	63	62	22	31	11
63	13	71	60	85	72	86	92	98	100	99	99	93	74	20	13	38	85	96	99
73	12	73	30	92	98	75	97	98	100	94	57	38	18	8,3	5,8	16	91	97	95
39	49	56	29	41	62	96	98	92	92	66	59	48	19	5,1	41	6,3	28	38	9,2
0,9	1,5	5,2	95	99	85	73	75	49	67	34	95	85	97	31	63	8,6	6,8	15	44

F(+) encoded average matrix of subject 5

84	97	100	94	82	68	75	89	98	98	50	6,1	34	17	1,7	2,5	6,4	19	58	75
100	95	93	89	84	87	94	94	99	93	69	29	34	21	21	83	99	15	28	100
75	97	91	96	94	99	88	81	90	80	55	93	99	89	40	98	97	19	4,5	20
83	92	87	71	79	94	98	99	99	85	53	79	94	95	36	22	32	26	29	18
17	38	46	59	86	99	99	99	93	94	89	99	99	45	14	15	90	5,1	40	8,7
26	48	51	55	88	97	97	95	90	93	84	93	87	41	33	40	15	3	5,8	9,8
99	96	87	75	93	95	90	94	93	65	48	32	46	98	98	63	25	20	74	40
30	51	90	75	100	100	83	70	69	51	26	12	15	31	33	37	92	64	66	99
41	66	74	58	69	88	81	89	99	76	46	25	95	26	19	45	99	96	11	4,6
1,1	4,5	14	39	98	99	87	41	36	52	21	93	91	99	15	29	79	27	12	12

F(+) encoded average matrix of subject 6

24	85	94	40	19	2,1	3	13	20	24	16	24	49	84	65	28	10	14	3,6	7,5
28	84	86	67	38	7	11	29	60	55	51	57	65	66	66	44	46	14	13	30
5,8	33	47	48	26	40	40	32	57	67	54	78	81	70	62	65	71	51	43	39
5,6	22	32	45	11	12	18	56	94	74	35	44	54	53	66	66	49	21	18	13
1,9	4,5	8,4	12	9,7	14	32	54	65	43	26	40	53	61	35	36	30	2,8	4,9	5,1
1,5	6,3	10	11	23	42	38	29	35	29	39	80	15	19	14	12	8	5,9	7,6	9
7,8	32	39	24	34	24	24	28	25	16	21	26	15	11	4,8	4,8	22	20	17	12
6,8	11	9,9	8,3	21	44	33	15	15	13	12	9,6	7,3	8,1	4,8	3,9	5,5	9,8	31	45
1,7	3,4	2,6	3,2	5,6	9,2	14	30	39	29	30	21	17	18	18	7,4	3,5	1	2,6	2,5
0,5	0,8	1,1	2,8	14	39	22	19	16	14	6,9	14	29	67	42	11	10	3,9	2,2	12

F(+) encoded average matrix of subject 7

27	90	82	3,2	6,5	1,8	22	14	22	44	2,3	0,6	1,6	0,6	0,5	0,7	2,8	0,4	0,5	1
19	34	44	19	9,9	12	19	61	73	37	17	3,5	2,9	4,6	4,3	21	11	4,1	14	0,6
2,7	9,4	21	28	39	48	28	29	31	35	20	66	32	16	14	76	52	16	18	0,8
9,8	28	42	28	15	13	12	30	42	28	67	57	25	22	16	73	36	18	6,7	2,6
8,3	18	18	11	6,5	11	17	21	24	34	64	48	69	22	2,5	14	43	1	1,3	1,7
23	22	7,5	4,4	19	11	16	27	44	34	25	45	86	13	1,3	2	8,5	4,5	14	9
77	48	23	17	21	20	25	36	28	17	18	52	33	4,4	0,8	3,8	19	27	64	28
39	33	28	16	76	87	50	49	37	62	12	4,2	1,7	1,4	0,6	1	9,5	25	81	74
17	27	20	19	39	54	72	97	51	35	33	11	8,3	2,6	1,1	0,4	1,6	29	95	70
3,8	11	13	16	41	35	48	55	40	26	8,3	12	17	68	1,5	0,6	1,3	35	72	23

F(+) encoded average matrix of subject 8

Normal Males (M-) are represented by 13 subjects as follows:

Normal Males (M-)

2	64	98	99	85	83	99	95	80	74	69	99	100	57	51	95	83	11	1,2	0,5
35	15	50	23	5,6	3,7	8,1	22	19	97	100	100	100	59	13	13	25	15	18	2
56	22	37	17	18	31	30	32	44	96	100	99	64	60	66	80	74	45	82	20
9,4	17	19	52	69	94	100	100	99	89	60	81	98	97	100	100	100	99	99	31
23	66	73	87	100	100	100	100	78	49	84	96	100	100	100	100	97	96	62	16
27	75	86	100	100	100	100	94	61	69	93	95	100	100	100	97	34	19	12	1,9
78	75	99	100	100	100	69	75	45	79	98	100	100	100	89	33	34	43	47	23
92	99	88	100	100	58	9,5	8	50	87	99	86	38	27	74	52	72	45	62	8,7
65	16	16	9,4	5,2	2,8	7,7	22	72	99	49	16	23	14	19	40	44	33	63	15
1,6	0,6	0,6	0,4	0,5	6	67	54	86	73	19	35	13	4,8	79	59	82	16	74	11

M(-) encoded average matrix of subject 1

57	83	72	76	72	69	87	81	87	99	70	76	93	61	72	31	81	60	64	13
24	39	95	92	85	60	68	73	81	74	71	66	83	67	36	59	24	26	17	18
58	66	68	80	58	44	50	73	67	70	79	70	77	75	50	32	33	39	24	81
28	93	91	77	68	45	58	60	69	83	84	62	72	85	83	74	75	69	63	64
49	44	43	39	46	59	77	97	82	73	71	83	92	88	80	83	73	44	56	31
25	77	64	54	59	93	96	95	85	62	94	95	82	84	82	74	64	87	53	55
52	72	79	90	95	95	91	88	82	58	81	63	82	64	61	46	36	46	61	48
82	88	78	89	94	91	83	68	68	83	62	71	48	34	49	60	47	67	65	39
91	87	65	64	78	74	77	79	79	88	79	37	25	29	52	40	65	72	69	47
33	65	71	66	55	70	87	96	88	81	74	30	24	32	31	63	84	51	58	40

M(-) encoded average matrix of subject 2

3	37	23	5,7	6,4	9,5	80	83	84	45	61	94	93	85	80	53	99	76	34	21
3,2	5,3	8,5	9,6	8,8	8,3	23	45	41	28	48	76	100	98	68	45	51	66	63	91
13	14	28	42	17	8	11	17	18	25	94	70	96	96	72	65	81	90	76	87
4	14	14	14	11	12	40	24	22	34	54	83	99	99	99	84	96	98	82	100
3,4	4,3	16	9,8	23	39	13	50	29	37	72	98	100	100	99	93	62	45	48	34
3,9	21	13	12	29	28	20	59	48	44	86	87	96	95	97	93	60	41	63	66
2,9	8,6	43	19	24	28	13	23	37	40	79	91	97	95	87	96	69	69	91	90
2,8	3,8	4,6	20	31	21	18	12	25	28	98	95	90	79	78	82	69	78	79	65
1,8	2,8	3,5	5,3	9,9	7,9	13	15	14	23	90	73	52	78	78	58	61	42	86	96
2,5	4	3,1	4	8,2	11	34	31	10	14	30	40	50	56	54	48	48	20	62	97

M(-) encoded average matrix of subject 3

29	51	82	46	24	7,9	4,3	8,4	43	22	9,9	14	80	24	28	4,8	34	55	38	1,1
7,2	16	26	12	5,7	3,2	2,6	6,7	25	21	27	17	70	31	11	58	5,9	12	35	27
4,9	13	8,6	6,9	3,6	3	2,8	4,1	3,3	6,8	25	11	21	23	25	17	34	15	4,9	27
2,1	6,8	9,3	14	7,6	2,5	16	8,8	19	5,8	14	42	39	39	43	36	22	19	11	9,3
2,7	4	7,3	3,8	3,3	3,5	3,5	4,8	5	4,8	15	47	61	51	27	32	12	4,1	3,6	3,6
3,5	6,1	4,1	6,8	10	7,6	6,5	18	14	6,6	44	25	23	36	24	10	4,5	3,8	4,2	5,5
2,1	3	4,1	13	37	39	11	19	17	8,8	25	18	57	16	27	31	11	13	37	38
7,3	11	5,3	8,9	19	22	17	22	40	18	9,5	33	14	8,4	27	52	28	50	14	9,8
5,1	6,5	4,2	12	26	26	40	50	30	28	42	20	12	23	42	11	21	17	3,6	4,5
7,6	23	20	28	20	34	74	95	72	16	22	21	17	37	19	16	28	4,7	6,5	14

M(-) encoded average matrix of subject 4

36	95	95	87	93	88	93	93	91	78	41	20	34	53	12	8,9	7,5	29	33	56
37	68	91	96	94	98	96	97	95	100	75	49	28	25	19	65	50	97	92	60
69	98	95	95	100	99	98	95	100	100	79	57	99	57	100	100	100	34	64	37
86	87	80	83	99	100	100	100	100	94	86	100	100	96	88	83	68	28	66	18
48	54	62	73	92	95	94	95	91	98	99	100	100	91	43	93	99	24	32	22
87	67	58	83	94	90	91	97	96	98	100	89	66	67	64	15	13	15	26	21
75	60	78	88	96	97	94	100	99	93	84	100	98	95	32	37	51	64	100	100
81	57	93	74	85	99	99	100	100	100	87	68	41	29	62	16	84	100	100	100
60	73	79	88	97	100	100	100	97	91	91	84	100	32	23	66	14	22	19	19
42	92	99	100	96	84	88	93	88	88	100	100	100	55	13	48	67	57	16	27

M(-) encoded average matrix of subject 5

7,1	18	21	5,3	5,5	3,1	46	35	47	6,5	5,3	16	58	26	13	2,6	14	1,7	2,1	1,9
3,2	2,8	7,5	47	7,1	3,2	4,9	16	15	6,3	9,1	12	65	54	8,5	4	3,1	3,7	2,5	5,8
52	37	8,3	6	4	3,7	3,3	6,6	6,9	9,4	55	19	32	24	11	5,3	8,8	8,2	3,2	14
6	55	37	17	17	6	14	11	77	52	34	16	23	29	32	22	31	18	17	44
19	16	9,5	4,5	5,3	7,7	14	78	54	53	25	41	70	51	37	47	23	6,9	3,8	5
11	18	8,3	8,7	24	35	50	76	38	19	61	74	44	54	66	56	31	10	3,2	3,7
4,2	12	11	11	16	49	49	32	23	20	38	31	73	44	30	17	9	7	15	24
5,5	8	19	42	52	15	16	25	49	24	44	28	21	15	9,2	18	8,5	22	11	11
47	28	6,9	11	20	10	11	10	10	18	21	7,6	6,3	6,1	12	3,6	8,3	9	4,9	18
6,8	15	5,5	7,9	9,7	12	8,2	34	9,3	14	10	5,1	4,2	6,9	5	8,3	15	3,5	4,9	17

M(-) encoded average matrix of subject 6

1,8	2,2	3,1	5,6	9,1	19	100	95	72	68	15	9,7	74	10	41	13	90	39	17	6,6
2	2,5	23	16	13	14	55	56	17	10	10	11	33	34	16	23	26	39	39	49
24	16	10	15	13	9,5	11	16	11	11	39	25	57	51	45	58	72	42	31	46
8,7	17	12	10	18	16	15	15	57	25	51	63	74	81	75	65	54	60	89	87
3,7	5,2	19	12	29	44	16	94	54	37	42	97	93	89	70	89	85	83	99	99
7	16	18	21	25	27	49	53	32	25	98	73	60	68	60	60	79	99	100	66
5,4	12	17	46	71	77	62	30	25	15	33	33	52	33	30	32	38	58	77	53
3,4	6,3	14	99	99	65	41	18	12	12	19	94	39	15	44	69	52	84	25	20
4,6	5	12	49	85	52	22	15	10	34	71	37	20	6,5	14	17	21	13	5,1	5
2,8	4,8	5,3	13	21	20	16	94	24	18	20	15	7,9	5,9	5	7,2	6,6	3,4	3	2,7

M(-) encoded average matrix of subject 7

45	61	53	50	99	100	100	100	100	99	64	52	67	22	19	6,4	49	30	11	2,6
17	27	100	100	98	80	97	99	100	94	73	43	80	43	16	17	8,5	22	20	46
42	49	75	83	55	46	52	77	93	91	76	44	47	36	43	20	33	13	5,3	14
22	44	46	66	58	39	56	59	73	99	96	50	57	52	42	26	18	15	17	17
56	39	27	26	33	39	46	99	79	67	57	41	66	54	51	55	29	12	22	31
15	18	21	35	51	87	81	79	72	53	71	37	34	60	61	43	22	51	9,5	9,1
14	25	41	71	94	100	100	91	49	47	42	31	69	41	56	30	13	14	29	22
38	47	95	98	100	97	94	70	84	59	33	28	20	21	47	42	19	41	13	6,1
99	98	65	60	89	83	95	94	70	90	46	33	18	23	30	13	21	16	9,4	7,4
24	41	39	43	64	93	100	100	98	91	75	36	27	25	13	25	46	6,8	6,9	4,2

M(-) encoded average matrix of subject 8

17	55	58	33	48	49	83	77	93	74	19	3,1	99	95	42	0,4	42	2,8	1,2	9,7
61	19	25	37	22	94	72	75	81	61	85	37	20	63	14	5	4,3	1,5	19	21
25	33	29	26	54	37	32	27	83	47	39	52	98	25	52	79	57	18	8,7	1
24	41	25	8,4	25	64	25	74	57	26	86	49	81	52	82	10	3,9	28	39	29
2,3	5,6	4,8	4,9	11	20	34	29	40	38	91	95	99	97	65	6,2	93	40	57	58
1,8	3,1	4	22	40	42	40	66	73	71	68	91	98	40	13	95	67	46	68	74
37	20	18	38	34	47	76	97	99	91	74	17	80	99	69	44	92	99	97	18
83	28	66	25	92	97	53	73	71	67	24	18	17	20	60	16	59	72	68	71
94	99	82	32	39	37	61	98	90	72	20	99	99	17	24	9,1	2,8	4,6	3,5	1,3
26	54	40	16	41	85	90	97	72	73	29	97	54	60	35	37	27	78	71	85

M(-) encoded average matrix of subject 9

1,5	2,1	5,2	3,5	3,2	3,1	19	14	21	63	23	59	98	78	51	23	84	33	11	5,7
1,5	1,6	47	12	6,4	4,5	5,7	7,8	11	12	50	56	100	98	53	34	23	24	15	11
6,3	8,6	5,9	15	17	4,7	5,4	7,6	8,3	14	86	78	96	96	85	46	54	61	52	73
2	8,6	10	7,8	7,5	8,4	21	12	46	28	52	71	75	91	96	95	91	83	70	83
3,5	3,5	4,2	3,7	20	64	46	46	21	32	44	89	96	98	97	95	92	97	96	48
3,6	6,7	5,7	6,2	11	19	41	49	29	22	85	80	67	76	78	76	91	100	100	38
2,8	5,5	10	9,1	18	44	32	27	26	17	56	62	96	60	76	77	65	82	79	41
7,2	18	16	44	74	18	13	10	16	15	34	74	75	41	62	73	36	45	40	29
21	13	5,3	5,4	15	8,3	6,1	7,1	7,4	41	36	20	23	14	26	21	25	42	17	15
2,1	2,7	2,6	2,9	6,4	6,1	7,9	49	12	6,4	6,9	7	7,6	14	15	25	31	15	21	11

M(-) encoded average matrix of subject 10

1,7	8,2	72	75	71	89	81	84	74	44	40	97	82	73	71	98	79	56	16	0,3
8,7	22	65	77	75	73	73	75	77	99	88	78	79	73	79	66	94	44	9,4	0,4
82	97	99	48	56	58	53	60	72	90	95	86	83	99	75	67	37	20	7	0,4
81	80	95	87	98	100	90	87	99	95	88	87	86	92	99	90	81	96	4,4	0,4
80	92	80	98	100	100	100	100	99	93	93	96	98	89	85	99	99	87	21	0,5
97	85	99	99	100	100	100	100	100	99	96	92	98	94	99	99	99	86	4,3	0,5
48	82	98	100	100	100	99	97	82	76	80	97	94	83	82	83	98	80	1,3	0,5
62	76	97	100	100	91	83	94	71	83	87	85	82	90	77	85	96	75	1,1	0,6
68	58	73	76	79	77	51	70	78	94	64	61	87	42	38	72	25	47	0,6	0,4
9,1	4,2	5,1	7,7	17	82	82	72	84	52	73	52	31	30	83	70	51	50	0,6	0,4

M(-) encoded average matrix of subject 11

41	71	81	85	81	84	89	91	91	91	92	93	98	96	76	75	88	61	16	2,3
0,5	1,3	0,6	1,1	1,3	0,3	1,3	16	56	89	88	91	92	95	88	45	2	26	88	89
56	60	58	80	4,1	6,6	12	8,8	14	11	59	76	91	45	91	67	2	84	1,1	88
89	3,9	41	63	78	88	93	94	90	72	89	57	81	91	98	94	88	69	73	81
14	23	31	73	94	96	83	94	92	85	10	90	97	89	89	89	90	89	57	12
13	28	69	94	92	77	95	86	79	93	89	79	46	12	2	1,3	25	46	0,4	0,4
53	65	86	91	96	96	69	93	93	66	92	97	76	91	92	35	57	0,5	5,1	6,3
74	71	68	90	92	95	64	81	77	88	96	97	89	90	23	34	21	17	55	42
55	38	17	12	50	79	78	82	80	91	91	26	17	85	90	58	60	62	32	88
1,9	14	20	63	23	67	88	90	54	89	5,6	57	83	88	85	81	66	87	59	88

M(-) encoded average matrix of subject 12

3,1	13	16	20	12	2,5	2,3	5,8	34	42	7,4	21	12	8,8	28	5,1	91	32	6,3	1,9
1,7	1,7	8,1	7	14	5,1	2,7	3,8	5	4,9	4,6	11	70	50	7,4	5	5,6	8,4	24	18
2,2	7,4	5,9	8,1	4,9	3,2	2,8	4,3	3,9	5,1	61	18	11	8,7	18	11	43	17	4,7	6,6
6,2	19	9,9	5,4	4,1	3	11	9,7	44	27	19	24	30	34	41	30	15	21	16	8,4
2	2,5	2,7	2,6	4,3	6,9	34	100	42	22	34	83	55	36	24	35	24	7	4,9	9,7
2,5	2,4	2,8	5,5	8,8	44	42	45	52	25	77	99	45	46	35	18	14	18	3,9	4,4
2,9	4,5	4,6	8,8	58	64	17	39	39	12	41	29	64	38	22	10	5,6	19	57	39
11	23	20	47	77	70	42	14	20	15	16	38	13	8,2	15	21	13	42	26	18
5,9	7	5,3	8,3	25	21	20	9,8	6,7	9,2	29	11	7,7	9,7	27	5,4	12	14	7,1	5,1
3,4	5,9	6,1	9,4	6,4	5,8	14	55	17	34	22	7,5	11	19	11	10	15	8,6	11	7,5

M(-) encoded average matrix of subject 13

Diabetic Males (M+) are represented by 10 subjects as follows:

Diabetic Males (M+)

31	27	40	63	46	67	52	86	80	82	90	91	96	91	94	84	82	64	64	8,2
15	18	26	34	29	26	32	61	82	85	92	88	76	93	56	63	47	84	69	62
76	70	60	51	27	29	35	57	53	44	73	87	77	64	75	94	34	89	16	60
55	67	71	65	78	70	50	49	70	76	58	87	84	96	81	85	90	81	53	60
75	69	75	69	75	46	54	95	77	86	77	78	78	92	81	65	45	14	8,2	8
71	73	72	73	67	73	89	96	82	83	90	46	57	54	40	40	55	28	16	26
68	77	83	81	88	84	85	87	93	96	75	80	94	53	65	51	32	72	63	62
57	77	63	72	63	80	84	90	85	97	76	74	56	66	84	79	74	53	57	43
67	70	61	58	70	73	80	67	73	87	78	74	51	67	82	62	71	58	33	52
29	78	47	78	65	64	76	64	36	83	51	70	51	67	54	65	77	73	59	61

M(+) encoded average matrix of subject 1

97	98	93	98	97	93	96	97	97	94	91	50	99	97	98	94	96	92	84	92
75	97	100	96	95	100	97	96	96	95	83	98	94	95	98	99	99	39	66	77
97	97	98	93	98	99	96	93	97	96	96	94	94	98	94	97	67	25	34	74
97	97	98	80	79	89	94	97	95	95	98	97	96	73	85	43	78	70	62	88
43	58	60	57	71	85	92	95	94	95	96	95	77	79	34	95	97	51	67	78
20	59	54	90	94	98	99	96	96	94	87	73	70	70	36	69	30	62	75	69
91	64	83	97	94	98	98	97	97	84	67	92	95	94	45	51	82	72	100	55
93	59	97	90	95	94	94	96	99	96	67	51	41	25	25	30	91	96	93	77
69	96	98	83	88	95	97	98	100	96	98	95	91	27	30	40	48	40	15	3,4
18	49	64	94	100	100	99	89	88	99	97	98	98	57	73	86	95	74	63	97

M(+) encoded average matrix of subject 2

99	96	94	99	93	94	96	96	96	94	84	94	96	99	99	67	95	94	68	96
93	98	97	99	96	97	97	95	97	95	83	93	99	99	100	98	96	47	96	80
91	96	97	92	98	98	97	92	96	96	95	95	96	93	99	96	51	32	78	91
91	95	97	83	86	97	100	99	96	97	97	99	96	93	70	43	92	60	84	84
53	76	74	81	92	98	98	99	98	99	98	92	94	93	34	38	86	46	62	84
51	77	84	98	99	99	100	100	99	100	99	80	57	47	46	73	49	69	93	91
94	96	96	97	97	97	99	100	98	94	68	60	97	98	92	96	98	99	99	97
98	88	95	95	98	95	98	97	98	93	71	50	78	79	81	63	98	95	100	99
96	89	92	83	82	96	99	97	97	97	91	97	97	52	45	60	50	64	64	52
10	20	26	100	94	96	99	97	92	92	53	93	97	98	31	85	93	94	94	98

M(+) encoded average matrix of subject 3

93	99	100	87	93	92	100	100	99	98	99	35	92	99	91	43	33	2,3	46	94
99	90	85	82	87	98	97	100	99	95	98	64	52	80	44	69	88	23	63	95
76	89	81	99	99	98	78	75	72	75	96	99	100	87	90	90	82	78	94	84
47	78	45	27	32	44	68	99	99	74	99	93	92	89	100	99	93	97	97	40
13	14	16	18	32	64	77	78	68	97	99	99	98	100	64	98	82	31	61	74
24	27	32	44	78	82	84	99	99	99	100	98	61	23	32	94	45	83	66	55
99	65	89	68	95	96	99	99	99	55	91	100	78	95	16	76	96	93	89	36
93	71	97	80	99	97	59	61	59	64	29	27	15	4,7	4,9	3,5	44	89	87	99
94	96	95	55	51	50	60	99	95	52	62	96	32	7,7	7,8	3,7	14	63	79	22
43	40	38	62	86	77	64	90	78	70	39	68	56	92	70	53	74	80	76	94

M(+) encoded average matrix of subject 4

9,2	98	68	12	38	28	55	66	70	71	52	21	85	80	45	7,9	15	32	63	58
93	54	48	47	46	53	82	88	95	48	87	91	70	83	45	70	84	62	56	70
23	51	61	76	92	99	78	52	53	52	84	93	79	87	54	80	98	53	39	76
46	57	67	39	26	35	34	94	82	61	85	76	88	85	94	52	78	29	75	78
5,2	12	17	16	14	22	44	77	65	85	89	93	98	95	37	20	96	14	76	83
1,6	3,6	5,8	14	58	49	36	54	66	68	64	62	93	55	16	8,4	21	16	81	94
49	20	24	41	87	74	79	76	58	46	87	42	48	26	23	31	97	92	91	41
33	26	69	58	98	100	81	77	65	98	49	22	11	8,9	16	14	21	35	84	61
65	62	71	67	90	92	89	98	98	69	36	81	84	12	19	11	14	29	18	19
9,7	20	35	90	99	99	94	96	78	85	22	19	12	47	97	18	25	22	28	55

M(+) encoded average matrix of subject 5

18	27	24	29	53	23	70	62	86	50	77	86	97	81	90	7,2	60	17	16	2
2,2	1,5	3,4	3,8	10	11	14	23	20	19	60	61	72	68	11	29	5,5	10	7,6	24
6,3	21	6,9	8,3	2,8	3	3	4,5	8,4	15	48	64	91	38	35	54	33	84	3,8	39
3,7	7,5	4,6	6,2	2,6	2,3	17	5,6	92	22	80	80	99	98	80	84	66	51	20	17
2,1	3,2	3	4,3	4,3	4,8	4,6	7,2	22	43	93	95	95	81	85	61	76	4,9	3,3	3,3
4,3	18	9,3	54	10	50	20	57	52	21	85	35	57	36	8,3	7,3	3,4	3,9	2,6	3,1
7,3	28	48	82	85	33	34	49	19	11	61	48	43	29	27	24	22	60	61	45
38	46	87	94	80	85	32	41	43	30	9,7	54	29	50	47	76	72	56	59	49
79	35	24	27	37	34	44	41	57	81	43	8,8	19	28	73	30	38	31	4,1	16
11	14	17	53	14	80	61	85	10	76	5,1	18	24	45	15	36	12	30	25	36

M(+) encoded average matrix of subject 6

40	62	44	66	9,6	2,5	97	47	67	36	42	71	70	92	84	4,5	80	49	46	2,3
3,3	4	4,6	4,9	5,1	3,4	6,8	62	54	100	13	56	96	83	18	60	7,9	82	55	68
11	29	7,6	16	4,4	5,6	5,4	27	6,9	11	55	97	100	64	90	89	37	68	3,7	31
5,1	9,4	39	95	64	62	70	10	93	96	94	99	92	79	34	50	47	64	22	34
44	46	62	15	9,9	9,4	83	98	20	39	98	77	70	29	54	50	50	4,2	4	49
60	40	37	56	8,1	81	81	84	45	26	49	16	34	7,2	6,3	13	34	38	2,5	4,3
14	38	28	27	20	81	31	52	11	89	80	87	80	37	63	13	4,9	44	49	30
23	42	47	73	48	47	13	64	99	86	35	87	18	55	92	88	65	23	32	24
41	12	10	56	69	46	70	26	20	10	53	80	20	41	72	19	41	34	16	29
40	41	44	56	62	13	30	33	5,5	55	3,3	58	22	36	22	52	12	49	36	52

M(+) encoded average matrix of subject 7

95	98	92	100	94	96	98	97	94	86	41	44	98	98	97	92	63	22	75	54
86	94	99	97	96	100	99	95	99	93	92	98	93	98	99	99	67	60	96	70
90	96	98	94	98	99	95	90	97	96	99	98	99	97	95	99	81	73	79	98
94	89	84	74	67	79	93	97	95	97	98	97	98	97	96	95	96	99	98	84
71	70	62	56	60	76	92	96	96	96	99	99	99	98	85	91	97	97	98	90
89	92	84	95	92	97	98	98	98	99	99	100	97	89	90	97	89	96	99	95
92	92	94	91	94	97	98	97	97	98	97	98	98	99	95	96	85	98	97	98
96	80	98	89	94	96	96	99	98	97	84	75	76	58	62	67	97	98	100	99
94	89	77	76	84	93	98	98	99	94	93	80	76	77	78	94	73	72	65	38
33	44	50	96	99	99	98	99	99	95	98	99	99	78	31	31	97	97	94	49

M(+) encoded average matrix of subject 8

97	95	95	98	99	97	94	95	95	91	97	66	96	97	81	48	78	17	27	23
72	94	99	98	97	96	97	97	98	96	95	92	88	83	81	97	63	65	71	88
97	98	97	98	96	94	98	90	85	97	83	95	95	80	92	97	97	55	48	33
65	72	86	84	98	100	100	99	96	98	76	87	96	98	99	98	85	27	33	35
29	44	61	83	92	96	98	97	94	90	93	94	99	99	74	79	21	4,8	22	31
85	75	65	91	99	97	96	100	98	99	99	100	98	81	32	18	9,5	8,6	17	5,3
92	88	98	97	99	95	100	100	100	90	88	91	61	47	24	25	35	59	86	69
96	80	99	95	98	99	98	98	99	97	74	45	40	32	42	42	75	97	100	89
84	77	83	81	85	97	100	99	100	97	85	61	74	54	83	98	94	91	57	24
9,9	41	61	99	99	99	99	99	97	96	94	83	99	89	98	99	99	97	85	87

M(+) encoded average matrix of subject 9

96	97	92	92	86	80	94	97	96	93	94	78	99	97	75	33	34	17	37	80
97	92	97	96	82	88	95	93	97	97	95	94	76	72	58	82	75	31	67	96
80	84	89	96	95	96	96	97	92	98	89	86	92	78	95	91	61	40	95	99
65	92	96	71	72	92	77	98	95	99	75	86	95	80	85	74	96	92	92	45
28	46	65	60	60	84	77	85	82	82	96	95	98	94	50	67	95	40	22	18
14	34	39	67	97	88	82	96	96	97	97	91	80	94	74	89	50	19	40	24
92	74	89	91	95	91	99	96	98	76	81	96	83	71	34	36	62	73	96	97
80	49	95	64	96	96	77	83	74	97	52	43	43	41	47	50	84	98	98	97
58	74	74	43	48	63	74	95	99	96	83	84	75	68	70	88	57	57	33	24
6,6	17	38	43	94	99	96	98	98	97	95	86	93	98	85	73	97	92	39	36

M(+) encoded average matrix of subject 10

2.1. Average electrical activity matrices by gender

The average matrix of each gender was compiled from the individual matrices of the subjects. Bright red cells show the average maximum light intensity of a sensor and dark blue color indicates the average minimum light intensity of a sensor (0%). The averages (AV) on the rows are shown in the left (back side of the torso) and the right (front side of the torso) of each matrix. The values in each matrix represent percentages from 0% to 100%. The AV on the columns are shown in the bottom of each matrix. Thus, the global matrix of normal females (F-) was compiled from the matrices belonging to 5 normal females:

AV	Back												Front												AV
41	10	23	45	63	44	35	47	63	50	29	25	23	43	17	32	8	18	4	4	2	18				
25	5	8	19	38	28	23	34	38	35	25	22	47	64	30	9	10	5	13	20	15	24				
26	34	46	27	43	34	17	17	18	13	12	44	35	37	16	48	36	36	17	6	13	29				
22	18	37	31	22	23	13	16	13	30	15	31	65	56	58	48	42	30	28	35	38	43				
21	15	15	13	9	9	9	13	45	35	46	44	65	64	51	47	43	36	8	10	9	38				
19	8	12	9	16	11	9	33	43	30	17	75	55	49	39	36	21	7	6	7	10	31				
19	7	13	17	19	29	24	29	20	21	13	47	47	74	30	36	31	8	30	46	37	39				
31	33	32	28	36	45	31	20	30	34	21	25	35	14	14	35	48	35	40	28	28	30				
28	58	41	18	17	21	16	31	19	20	42	35	36	15	21	37	10	14	18	15	18	22				
27	12	16	14	22	11	37	47	44	29	38	26	15	13	27	12	13	16	11	12	33	18				
AV	20	24	22	28	26	21	29	33	30	26	37	42	43	30	34	26	20	17	18	20					
SD	17	14	11	16	13	10	12	16	10	12	16	17	23	15	14	16	12	12	14	13					

F(-)

AV = Average
SD = Standard deviation

The global matrix of diabetic females (F+) was compiled from 8 matrices of diabetic females:

AV	Back										Front										AV
54	50	69	66	50	45	33	48	51	66	60	37	30	47	45	40	24	31	30	32	36	35
50	33	45	56	50	43	46	47	57	66	60	47	52	60	47	40	58	53	31	37	45	47
52	44	51	48	54	50	55	49	50	58	60	52	68	67	60	52	71	67	43	42	38	56
54	46	64	60	44	39	46	52	60	68	61	54	64	61	58	61	61	53	35	33	29	51
42	15	22	27	30	42	46	51	65	59	62	63	70	74	55	37	45	58	22	27	18	47
45	11	26	24	31	52	59	58	63	64	59	64	76	58	43	37	45	37	31	28	18	44
55	44	40	52	48	63	66	65	66	62	48	50	55	54	52	44	34	29	40	65	43	47
57	38	34	56	49	78	80	62	60	56	55	38	31	24	21	24	27	33	49	60	59	37
51	45	48	42	38	45	50	56	66	61	54	43	37	43	30	29	28	35	37	35	26	34
38	8	13	17	44	54	55	53	54	36	44	27	41	50	69	34	37	39	35	42	40	41
AV	33	41	45	44	51	53	54	59	60	56	47	52	54	48	40	43	43	35	40	35	
SD	16	18	17	8	12	13	6	6	9	6	12	17	14	14	11	16	13	7	13	13	

F(+)

AV = Average
SD = Standard deviation

The global matrix of normal males (M-) was compiled from 13 matrices of normal males:

AV	Back										Front										AV
52	19	43	52	46	47	47	68	66	70	62	40	50	76	53	45	32	65	37	19	9	43
37	16	17	42	41	34	34	39	46	48	54	56	50	71	61	33	34	25	30	34	34	43
36	38	40	41	40	31	27	28	33	40	44	68	54	67	54	56	50	48	37	28	38	50
45	28	38	38	39	43	44	49	50	65	56	63	60	70	72	75	62	57	54	50	44	61
45	23	28	29	34	43	52	51	76	59	53	57	81	87	79	67	70	67	49	43	29	63
49	23	33	35	42	49	58	62	71	60	53	82	78	66	64	60	57	46	48	34	27	56
52	29	34	45	53	65	72	60	62	55	48	63	59	80	66	58	44	44	46	54	39	55
54	42	41	51	64	78	64	49	46	52	52	54	63	45	37	48	48	47	57	43	32	47
45	47	41	33	33	47	45	45	50	50	60	56	40	38	29	36	32	29	30	25	25	34
40	13	25	24	28	28	44	58	74	55	50	37	39	33	33	34	38	44	31	30	31	35
AV	28	34	39	42	47	49	51	57	56	53	58	57	63	55	51	47	47	42	36	31	
SD	12	8	9	11	15	13	12	14	9	5	13	14	18	17	14	13	14	10	11	10	

M(-)

AV = Average
SD = Standard deviation

The global matrix of diabetic males (M+) was compiled from 10 matrices of normal males:

AV	Back										Front										AV
77	67	80	74	74	71	67	85	84	88	79	77	64	93	93	85	48	64	41	53	51	67
71	64	64	66	66	64	67	72	81	84	82	80	83	82	85	61	77	63	50	65	73	72
69	65	73	69	72	71	72	68	68	66	68	82	91	92	79	82	89	64	60	49	69	76
70	57	66	69	62	61	67	70	75	91	82	86	90	94	89	82	72	82	67	64	57	78
59	36	44	49	46	51	59	72	83	72	81	94	92	91	86	60	67	74	31	42	52	69
69	42	50	48	68	70	81	78	88	83	79	87	70	70	56	38	51	39	42	49	47	55
77	70	64	73	77	85	85	82	85	77	74	80	79	78	65	48	50	61	76	83	63	68
80	71	62	85	81	87	89	73	81	82	86	55	53	41	42	50	51	72	74	81	74	59
75	75	70	68	63	70	74	81	82	84	78	72	76	62	43	56	51	50	54	38	28	53
66	21	36	42	77	81	83	82	85	68	85	56	69	65	71	58	60	68	71	60	66	64
AV	57	61	64	69	71	74	76	81	79	79	77	77	77	71	62	61	64	57	58	58	
SD	18	14	13	10	11	10	6	6	8	5	13	13	17	19	16	14	12	16	15	14	

M(+)

AV = Average
SD = Standard deviation

2.2. Back side vs. Front side

Average values of the matrix rows or columns (left-right-bottom) are colored in different colors for a good visual correlation with the tables. The average signals across the rows and columns of the matrices have been compared by using the areas which correspond to the ventral and dorsal part of the torso: (a) the average values from the rows of the first half of the matrix (back side) have been plotted against the average values from the rows of the second half of the matrix (front side), (b) the average values of the columns from the first half of the matrix have been plotted against the average values of the columns from the second half of the matrix. The means (AV) and standard deviations (SD) are shown at the bottom of the table below (Table 7). At the bottom of each table, the chart shows Back vs. Front on rows (first two on the left) and Back vs. Front on columns (last two from the right):

In the above graphs, black dots represent diabetic individuals and gray dots represent normal individuals (Table 7). At the bottom of each table from below, the chart shows the center of the clusters seen in the above charts (Table 7). The last two columns in each table below show the standard deviations of the average values from the rows or columns of a matrix.

In the above graphs the green color represents the diabetic group and the dark red represents the normal group (Table 8). Square shapes represent the males and the round shapes represent the females. The mean values on the columns of the F(-) matrix and the M(-) matrix were plotted on the chart from below for an overview of the differences in the electrical activity on the back and front of the torso. The origin of the chart is shown in the table below (Table 9):

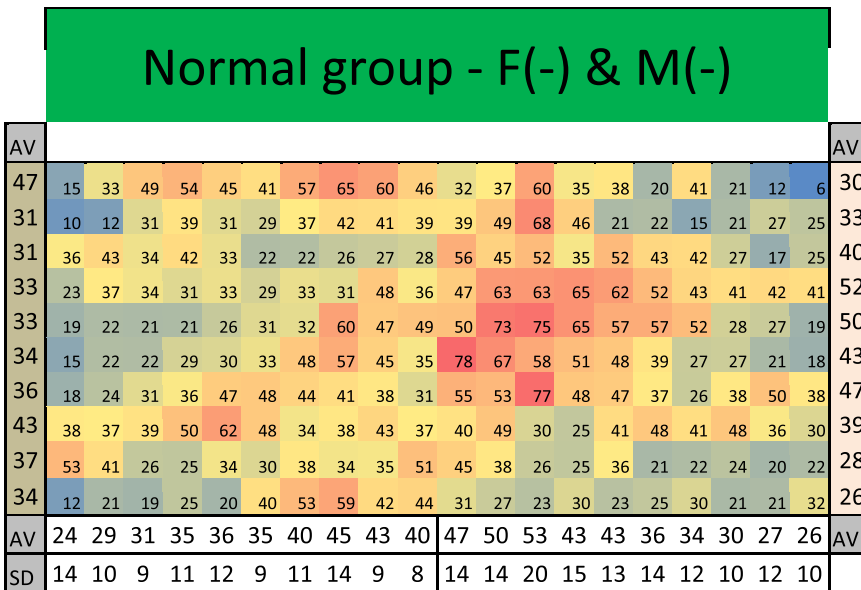
The mean values on the rows of the F(-) matrix and the M(-) matrix were plotted on the chart below for a second overview of the electrical activity of the torso (Table 10).

In contrast, to observe the gender differences in diabetic individuals, the mean values on the columns of the F(+) matrix and the M(+) matrix were plotted on the chart from below. Again, the origin of the chart is shown in the table below (Table 11).

To follow the same pattern of analysis as in the normal group, the mean values on the rows of the F(+) matrix and the M(+) matrix were plotted on the chart below for a second overview of the electrical activity of the torso (Table 12).

2.3. The electrical activity in normal and diabetic individuals

Global matrices of the electrical activity in normal and diabetic individuals were compiled by joining the gender matrices. Bright red cells show the average maximum light intensity (100%) of a particular sensor and dark blue color indicates the average minimum light intensity of a sensor (0%) across all individuals in a group. Like before, the averages (AV) on the rows are shown in the left (back side of the torso) and the right (front side of the torso) of each matrix. The AV on the columns are shown in the bottom of each matrix. The global matrix of the normal group (-) was compiled from the matrices of F(-) and M(-):



The mean values on the columns of the global matrix from the normal group were plotted on the chart below for an overview of the electrical activity of the torso on the back and

Table 7
Back vs. Front on rows (left) and Back vs. Front on columns (right).

Rows				Back side vs. Front side				Columns						
Ba	Fr	Ba	Fr	Ba	Fr	Ba	Fr	M+	M-	F+	F-			
M(+)	M(-)	F(+)	F(-)	Ba	Fr	Ba	Fr	Ba	Fr	Ba	Fr			
77	67	52	43	54	35	41	18	57	77	28	58			
71	72	37	43	50	47	25	24	61	77	34	57			
69	76	36	50	52	56	26	29	64	77	39	63			
70	78	45	61	54	51	22	43	69	71	42	55			
59	69	45	63	42	47	21	38	71	62	47	51			
69	55	49	56	45	44	19	31	74	61	49	47			
77	68	52	55	55	47	19	39	76	64	51	47			
80	59	54	47	57	37	31	30	81	57	57	42			
75	53	45	34	51	34	28	22	79	58	56	36			
66	64	40	35	38	41	27	18	79	58	53	31			
AV	71	66	46	49	AV	50	44	26	29	AV	71	66	46	49
SD	6	8	6	10	SD	6	7	7	9	SD	8	8	10	10

Fr = Front side
Ba = Back side
AV = Average
SD = Standard Deviation

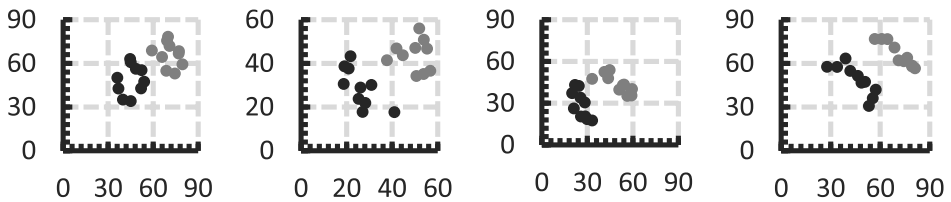


Table 8
Standard deviation of the average values from the rows and columns of a matrix.

Rows					Columns				
	Ba	Fr	SD;Ba	SD;Fr		Ba	Fr	SD;Ba	SD;Fr
M-	46	49	10	10	M-	46	49	6	10
M+	71	66	8	8	M+	71	66	6	8
F-	26	29	4	10	F-	26	29	7	9
F+	50	44	9	7	F+	50	44	6	7

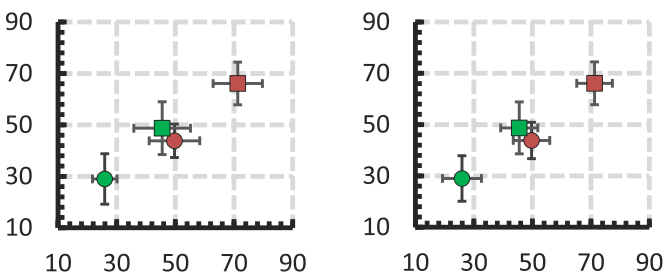


Table 9
Mean values on the columns of the F(-) matrix and the M(-) matrix.

	F	20	24	22	28	26	21	29	33	30	26	37	42	43	30	34	26	20	17	18	20
M		28	34	39	42	47	49	51	57	56	53	58	57	63	55	51	47	47	42	36	31

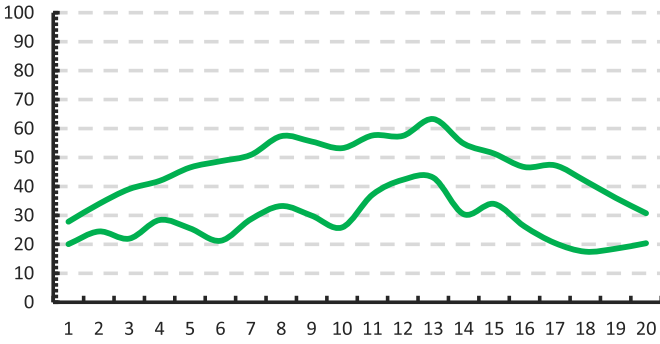


Table 10
The mean values on the rows of the F(-) matrix and the M(-) matrix.

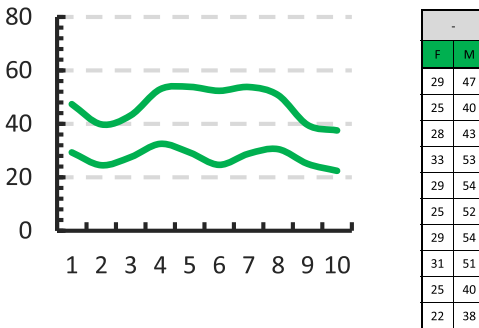


Table 11
Mean values on the columns of the F(+) matrix and the M(+) matrix.

	F	33	41	45	44	51	53	54	59	60	56	47	52	54	48	40	43	43	35	40	35
M		57	61	64	69	71	74	76	81	79	79	77	77	77	71	62	61	64	57	58	58

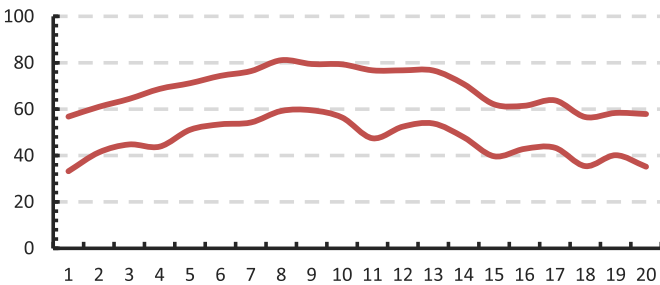
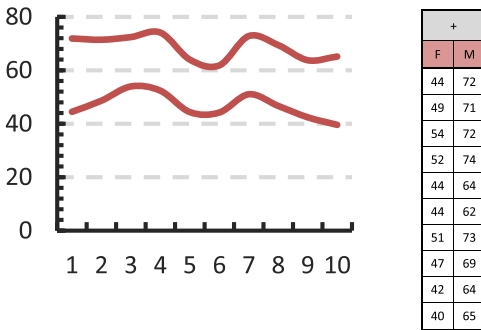


Table 12
The mean values on the rows of the F(+) matrix and the M(+) matrix.



front of the vest (Fig. 3). The chart shows the average values from the columns of the global matrix:

In contrast, the global matrix of the diabetic group (+) was compiled from the matrices of F(+) and M(+):

Diabetes group - F(+) & M(+)

AV																			AV		
65	59	75	70	62	58	50	67	68	77	70	57	47	70	69	63	36	47	35	42	43	51
61	48	55	61	58	54	56	59	69	75	71	63	68	71	66	51	67	58	41	51	59	59
61	54	62	59	63	60	64	59	59	62	64	67	80	80	69	67	80	65	51	46	54	66
62	51	65	64	53	50	56	61	67	80	71	70	77	77	73	72	67	68	51	48	43	65
51	26	33	38	38	47	52	62	74	65	72	78	81	82	70	48	56	66	27	35	35	58
57	26	38	36	50	61	70	68	75	74	69	76	73	64	49	38	48	38	37	39	32	49
66	57	52	62	62	74	75	74	76	70	61	65	67	66	59	46	42	45	58	74	53	58
68	54	48	70	65	82	84	68	70	69	70	46	42	32	32	37	39	52	62	70	66	48
63	60	59	55	51	58	62	69	74	72	66	58	57	52	37	42	39	42	46	37	27	44
52	15	25	30	60	67	69	67	70	52	65	41	55	58	70	46	48	54	53	51	53	53
AV	45	51	55	56	61	64	65	70	69	68	62	65	65	59	51	52	54	46	49	47	AV
SD	16	15	15	8	11	11	5	5	8	4	12	14	15	15	12	15	11	11	13	13	

The mean values on the columns of the global matrix from the diabetic group were plotted on the chart from below for an overview of the electrical activity of the torso on the back and front of the vest (Figs. 4 and 5):

A comparison was made for the average signals on the columns of the two global matrices in order to observe any differences between groups:

The source of the previous chart is shown in Table 13.

The average values from the columns of diabetic females and diabetic males (F+ and M+) have been plotted against the average values from the columns of normal females and normal males

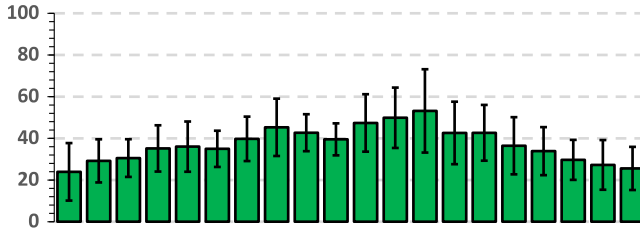


Fig. 3. Mean values on the columns of the global matrix from the normal group.

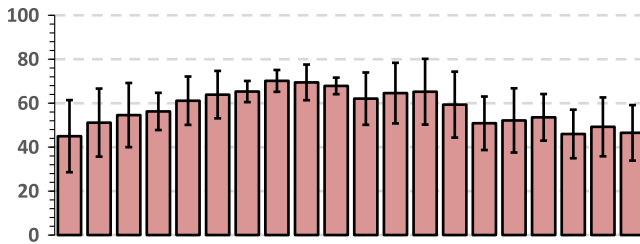


Fig. 4. Mean values on the columns of the global matrix from the diabetic group.

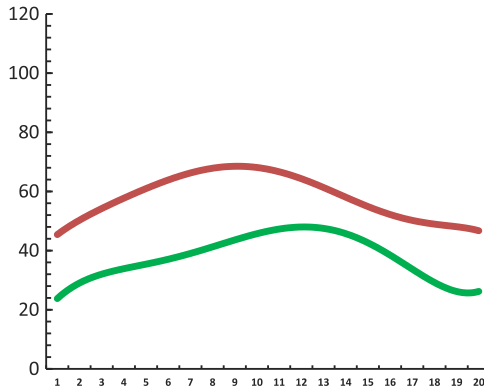


Fig. 5. The average signals on the columns of the two global matrices.

(F- and M-) (Fig. 6). In the chart below the green color represents M(-) vs. F(-) and the dark red represents M(+) vs. M(-).

The source of the chart from Fig. 6 is shown in Table 14.

Table 13

The average signal values (%) on the columns of the two global matrices.

N	24	29	31	35	36	35	40	45	43	40	47	50	53	43	43	36	34	30	27	26
D	45	51	55	56	61	64	65	70	69	68	62	65	65	59	51	52	54	46	49	47

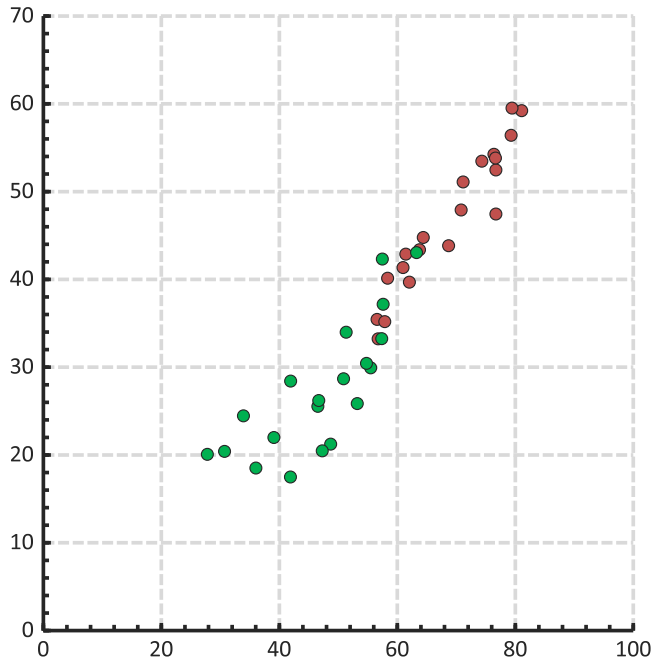


Fig. 6. The average values from the columns of F(+) and M(+) vs. F(-) and M(-).

Table 14

The average values (%) from the columns of F(+), M(+), F(-), M(-).

M-	28	34	39	42	47	49	51	57	56	53	58	57	63	55	51	47	47	42	36	31
F-	20	24	22	28	26	21	29	33	30	26	37	42	43	30	34	26	20	17	18	20
M+	57	61	64	69	71	74	76	81	79	79	77	77	77	71	62	61	64	57	58	58
F+	33	41	45	44	51	53	54	59	60	56	47	52	54	48	40	43	43	35	40	35

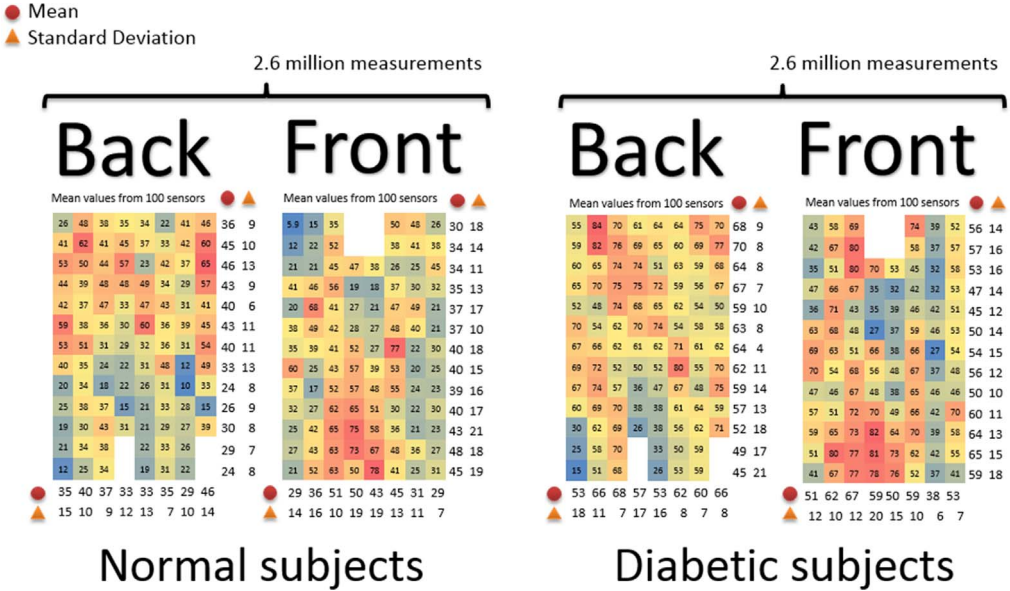


Fig. 7. Decoded global matrices [2].

2.4. The 3D electrical activity maps in normal and diabetic individuals

The left and right sides of the global matrices were decoded (rearranged) for each group according to the actual positions of the sensors on the surface of the human torso (Fig. 7) [2].

Based on the above data, a series of three-dimensional heatmaps of the electrical activity of the torso have been compiled (Figs. 8–13).

Schematic representation of the relative positions of the sensors overlapped over different maps are shown in Figs. 14–19.

The average electrical activity on each Vertical Sensor Line (VSL), is presented in Fig. 20 for each group.

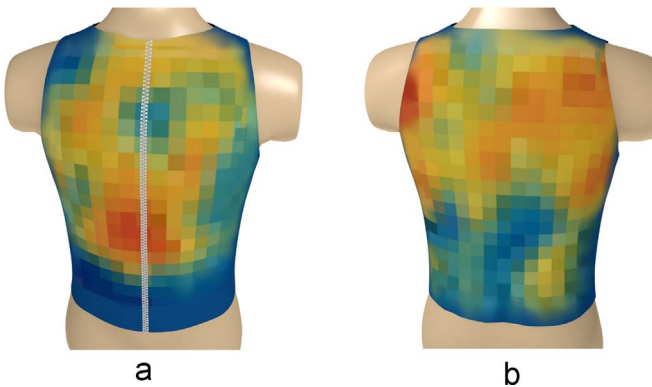


Fig. 8. The electrical activity map based on nearest neighbor interpolation (NNI) of the decoded matrix. (a) The average of the front side and (b) the back side of the torso in the normal group.

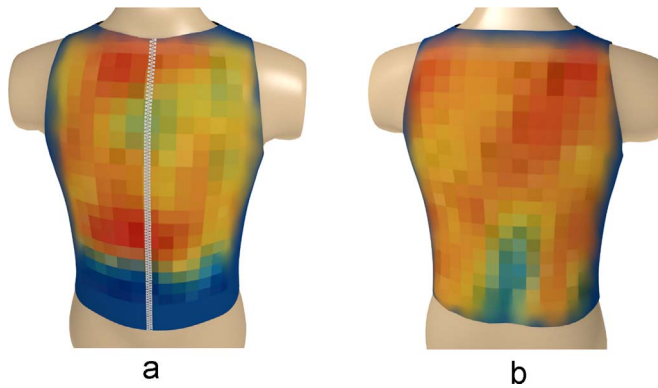


Fig. 9. The electrical activity map based on nearest neighbor interpolation (NNI) of the decoded matrix. (a) The average of the front side and (b) the back side of the torso in the diabetic group.

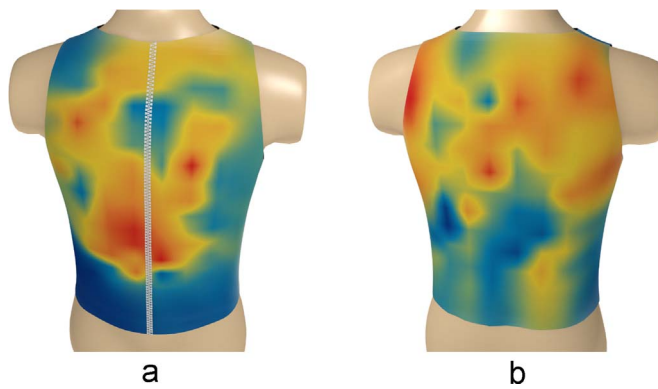


Fig. 10. The electrical activity map based on bicubic interpolation (BI) of the decoded matrix. (a) The average of the front side and (b) the back side of the torso in the normal group.

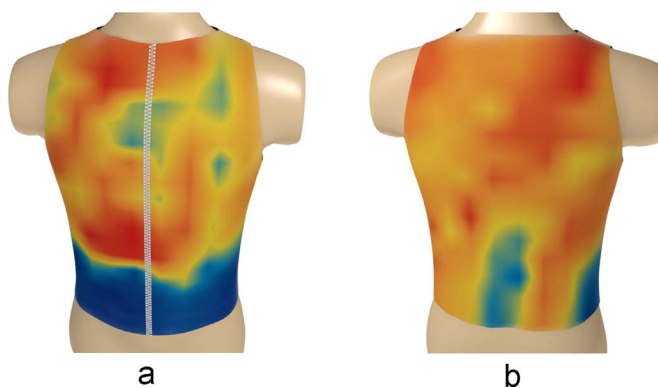


Fig. 11. The electrical activity map based on bicubic interpolation (BI) of the decoded matrix. (a) The average of the front side and (b) the back side of the torso in the diabetic group.

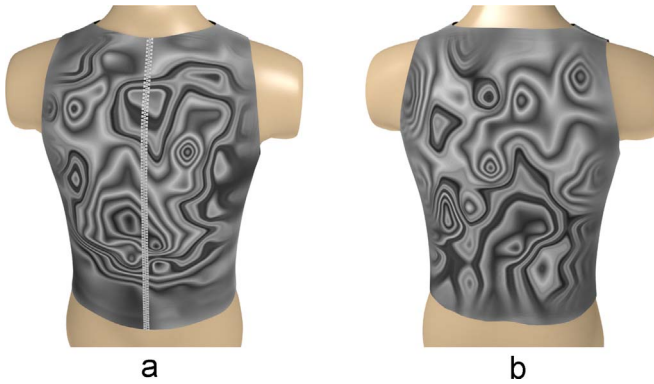


Fig. 12. The electrical activity map based on contour lines (CL) of the decoded matrix. (a) The average of the front side and (b) the back side of the torso in the normal group.

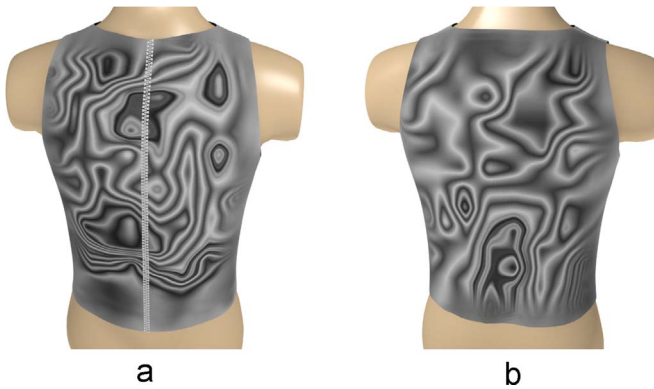


Fig. 13. The electrical activity map based on contour lines (CL) of the decoded matrix. (a) The average of the front side and (b) the back side of the torso in the diabetic group.

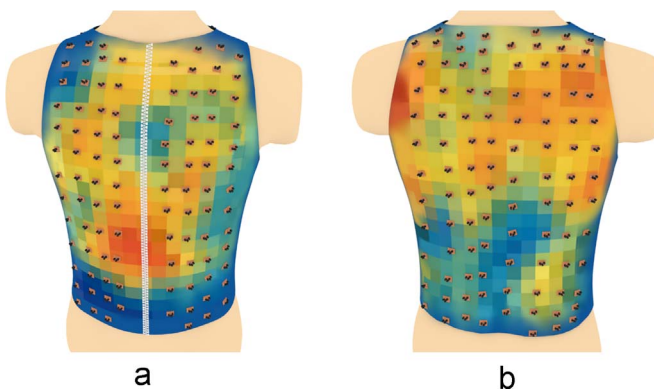


Fig. 14. Relative positions of the sensors overlapped over the NNI electrical activity map on (a) the front side and (b) the back side of the torso in the normal group.

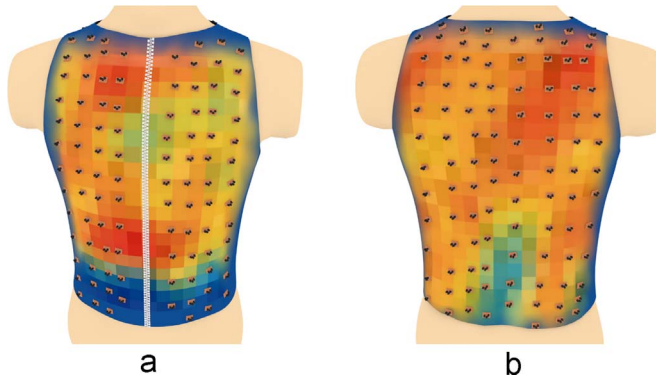


Fig. 15. Relative positions of the sensors overlapped over the NNI electrical activity map on (a) the front side and (b) the back side of the torso in the diabetic group.

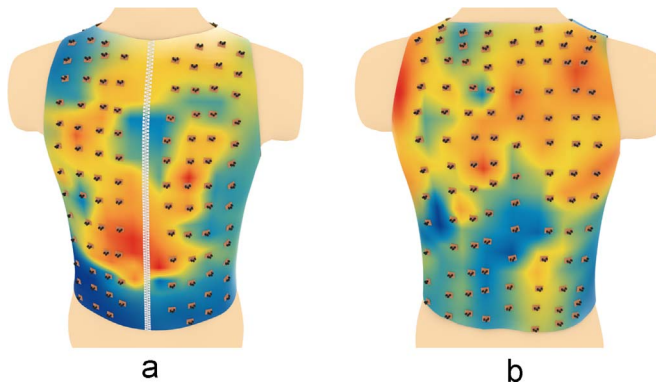


Fig. 16. Relative positions of the sensors overlapped over the BI electrical activity map on (a) the front side and (b) the back side of the torso in the normal group.

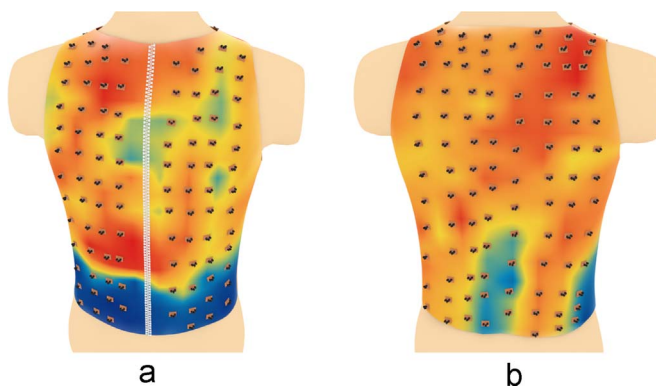


Fig. 17. Relative positions of the sensors overlapped over the BI electrical activity map on (a) the front side and (b) the back side of the torso in the diabetic group.

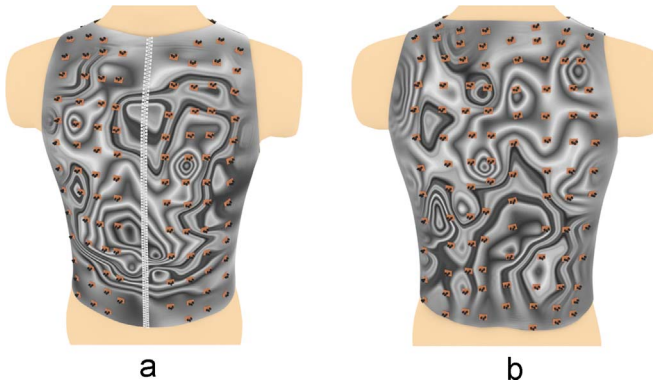


Fig. 18. Relative positions of the sensors overlapped over the CL electrical activity map on (a) the front side and (b) the back side of the torso in the normal group.

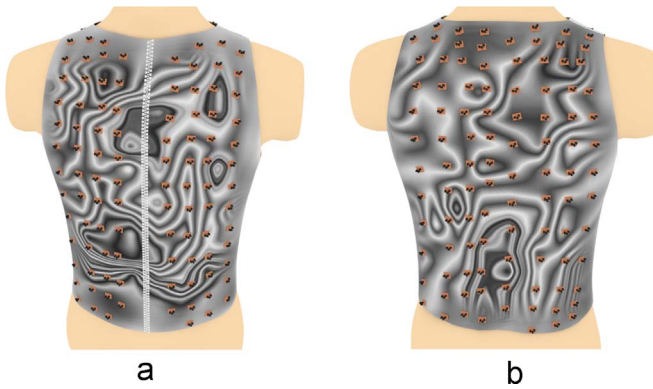


Fig. 19. Relative positions of the sensors overlapped over the CL electrical activity map on (a) the front side and (b) the back side of the torso in the diabetic group.

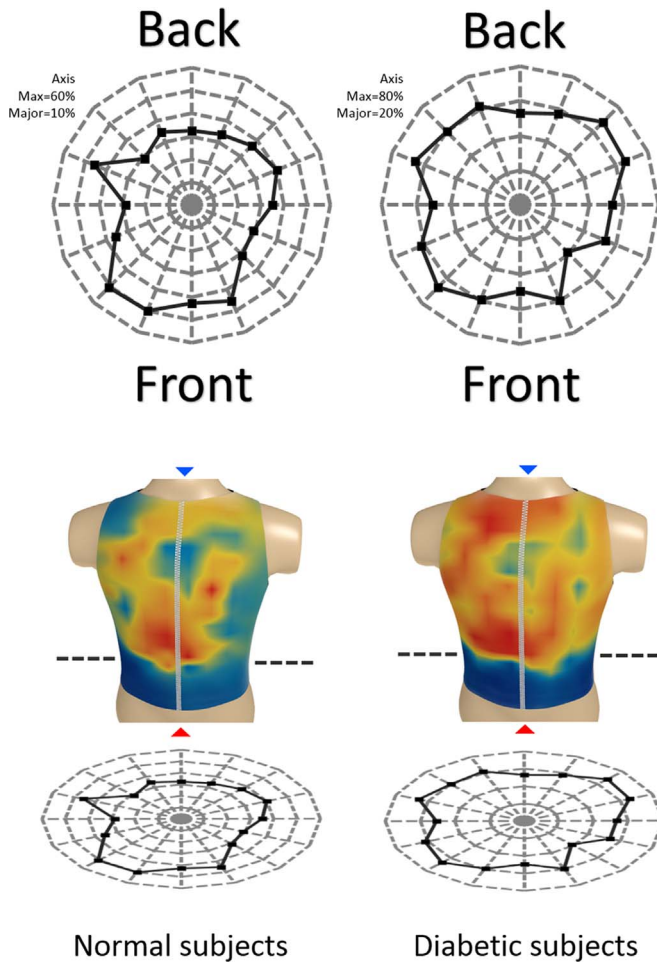


Fig. 20. A VSL fits between 11 and 13 sensors in a vertical line.

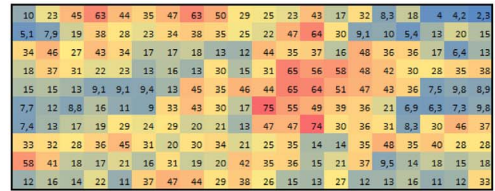
3	3,4	4,2	5,8	4,3	2,3	11	4,6	5,3	7,5	7,9	11	5,4	4,2	25	3,9	7,9	2,9	2,8	2,4
2,6	2,2	2,5	6,6	6,7	2,2	2,6	6	7,7	4,5	25	33	93	10	6	4,3	3,9	9,6	19	23
73	28	3,2	3,1	3	2,8	2,5	3,9	5,7	11	24	11	20	11	34	17	23	15	7	4,3
4,2	8,8	5,3	7,7	7,4	2,8	3,3	4,1	6,1	10	16	65	44	31	31	28	18	25	55	27
2,5	7,4	7,3	2,3	2,4	3,3	3,9	8,7	20	6,8	15	65	63	48	33	34	13	5,5	4,5	6
2,9	3,8	2,9	2,9	3,9	4,2	4,2	32	7,5	5,7	91	92	37	30	13	6,7	4,1	5	4	5,1
2,1	2,6	2,6	3,7	4,6	2,1	18	5,9	5	4,4	11	16	58	23	17	18	7,2	12	41	33
4,6	3,7	10	27	37	8,4	6,2	5,8	32	13	5,7	17	11	7,7	20	34	13	34	19	13
47	26	3,8	3,4	6,5	3,5	3,4	2,6	2,6	4,1	7,5	17	12	16	32	7,5	14	15	9,9	17
3	13	7,4	2,9	2,3	2,5	2,2	2,7	2,3	4	14	13	14	27	13	13	31	7,7	19	23

F{ } encoded average matrix of subject 1

8,7	18	7,1	58	51	66	100	99	56	30	20	12	8,1	4,7	40	23	3,7	3,1	2,7	2,1
2,4	2,4	8,7	28	32	26	68	74	20	10	7,6	23	35	6,7	8,8	7,1	4,4	12	11	6,3
3,4	5,5	6,8	79	89	14	16	18	8,1	6	13	8,3	11	9,4	32	25	25	10	7,8	6,1
4,1	7,7	5,5	21	30	9,2	6,5	5,9	5	5,9	6,4	41	36	32	52	38	15	10	9	33
1,8	3	5,1	3,9	4	4,6	4,1	6,1	6	6,4	12	35	46	29	25	17	9,7	5	4,3	2,3
2,6	3,3	3,2	3,8	4,1	3,2	3,5	12	10	5,2	36	20	21	31	58	37	5	3,4	3,3	3,8
2,5	4	2,5	3,4	3,9	3,9	7,2	9,3	16	11	8,3	19	81	19	12	8,2	5,2	7,5	17	15
9,8	15	5,9	15	36	8,4	4,5	4,9	9,2	7	38	15	12	8,6	23	33	10	41	8,1	6
86	70	14	4,5	7,7	5,1	3,8	3,1	2,9	7,4	17	23	19	9,6	36	9,3	6,8	12	8	20
7,7	9,4	4,1	4	3,9	3,8	3,2	5,2	3,6	4,1	28	6,8	10	22	14	7	15	5	12	28

F{ } encoded average matrix of subject 2

11	54	97	65	25	4,2	6,7	17	21	3,4	4,5	12	91	24	9,1	2,9	47	4,4	2,7	2
5,8	10	28	19	13	4,7	3	7,3	9,3	3,8	6	9,6	66	51	8,3	4	4,1	8,1	32	13
40	65	51	49	12	4	2,9	4	3,3	3,5	84	38	16	14	36	22	39	12	3,5	24
38	52	39	25	20	6,5	9,1	4,9	16	10	9,9	62	37	58	41	37	11	16	8,5	16
47	44	24	8,8	5,7	5,1	3,6	24	34	85	47	46	49	32	22	23	9,6	4,2	17	12
15	29	13	13	13	3,9	4	41	44	25	52	36	12	11	9,9	8	4,8	3,9	4,1	4,4
3	6,1	3,8	4,6	4,5	4,3	5,1	24	24	10	35	21	52	25	11	8,9	4,4	11	40	28
2,4	2,5	2,2	4	14	16	7,2	11	44	22	21	7,3	6,8	5,6	13	26	12	32	16	18
2	2	4,1	7,5	7,8	19	33	12	9,7	30	54	17	7,3	7,9	25	6,1	12	14	5,2	5,6



Normal Females (F-)

Run Mean LED

Fig. 21. The average matrix elements were obtained by using Supplementary material 2 shown above (please press Alt+F11 to see and run the code).

3. Experimental design, materials, and methods

A total of 36 individuals have been divided equally into two groups and subjected to a short glucose tolerance test for 1 h; one group with established Type 2 Diabetes (T2D) and the other group without diabetes. During this time, a collection of 200 sensors have been placed across the entire surface of the trunk [2]. The output of each sensor was remotely inserted into a 20 × 10 LED matrix for a parallel capture of the electrical signals. Continuous observations of the electrical activity pattern were made above the LED matrix by a digital camera in an obscure environment. A total of 25,920 matrices/maps have been recorded as light intensities from the LED matrix and converted into percentages for evaluation (Fig. 21).

VBA code preview for the average between matrix elements (Supplementary material 2):

```

Public Sub LED_MEAN_button()

    Application.ScreenUpdating = False

    Dim Sheet As Worksheet
    Dim ws_p As Workbook
    Set ws_p = ActiveWorkbook
    ws_p.Sheets(s).Activate

    s = ActiveSheet.Name

    ws_p.Sheets(s).Activate

    Rs = 1
    Cs = 2

    MaxR = 20000
    For i = Rs To MaxR
        n0 = Cells(i, Cs).Value
        n1 = Cells(i + 1, Cs).Value
        n2 = Cells(i + 2, Cs).Value
        If n0 = "" And n1 = "" And n2 = "" Then
            mR = i + 1
            i = MaxR
        End If
    Next i

    Dim SetI() As String
    ReDim SetI(1 To 10, 1 To 20) As String

    For q = 1 To mR Step 12
        For j = 2 To 21
            co = 0
            For i = q To q + 10 - 1
                co = co + 1
                SetI(co, j - 1) = Val(SetI(co, j - 1)) + Val(Cells(i, j).Value)
            Next
        Next
    Next

    For j = 1 To 20
        For i = 1 To 10
            Cells(i, j + 51).Value = Val(SetI(i, j)) / (mR / 12)
        Next
    Next

    Application.ScreenUpdating = True

End Sub

```

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Transparency document. Supporting information

Transparency data associated with this article can be found in the online version at <https://doi.org/10.1016/j.dib.2018.09.134>.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.dib.2018.09.134>.

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