

Effects of Lifewave Patches on Acupuncture Meridians & Biophoton Emission in Human Subjects (A Pilot Study)

by

Toshiaki Harada, Ph.D.

Koji Tsuchiya, Ph.D.

Subtle Energy Research Laboratory,
California Institute for Human Science
701 Garden View Court,
Encinitas, California 92024

Contract Research Report

Revised by: Gaetan Chevalier, Ph.D. and Karl Maret M.D. (Dove Health Alliance)

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Abstract:

Objectives:

To study if application of Lifewave Energy Enhancer Patches induces any detectable change(s) in the functioning of Acupuncture Meridians and/or in Biophoton Emission intensity.

Design and subjects:

Continuous AMI and Snapshot AMI devices were used to monitor the energetic conditions of the acupuncture meridian system, and photon counting system was used to detect biophoton emission from subject's right hand. Heart rate from electrocardiography (ECG), pulse rate from photoplethysmography (PPG) and respiration were also monitored from a Polygraph system (Polygraph) along with continuous AMI measurements to acquire supplementary information. Following suggestions from Lifewave, the tan patch was applied to the acupuncture point #1 of the Kidney meridian on the left sole and the white patch on the same acupuncture point on the right sole of the subject. A total of ten (10) nominally healthy male subjects ranging from 19.2 to 43.3 years old were recruited and tests were conducted "before patches" and "with patches" applying the Energy Enhancer Patches. Tests were conducted in the following order: (1) Blood pressure and heart rate; (2) Snapshot AMI; (3) Biophoton emission (4) Continuous AMI with Polygraph (15 min control period, no patch); (5) Continuous AMI with Polygraph (30 minutes continuous monitoring with patches); (6) Biophoton emission (with patches); (7) Snapshot AMI (with patches); (8) Blood pressure and heart rate. Results were processed and observed changes between "before" and "after" were extracted for analysis.

Outcome Measures:

Where applicable, changes between "before patches" and "with patches" were subjected to statistical test for significance with $p=0.05$ as the preset criterion for statistical significance. Where not applicable, qualitative observations were made based on trends in the graphs of the parameters monitored.

Results:

Possibly as effects of wearing the Energy Enhancer Patches on the soles, it was found that:

- i) Biophoton emission from the right palm tends to decrease.
- ii) Body's energetic functions (Ki-energy, sympathetic nervous system & immune system activities) tend to shift to the lower half of the body.
- iii) Immune system activities tend to be enhanced in the entire body.
- iv) No common patterns were evident in individual meridian left-right balance.
- v) Autonomic nervous system function, from measurements of heart rate variability (HRV) and respiratory frequency, tends to shift toward a parasympathetic dominant state.

Conclusion:

Statistically significant results were obtained strongly indicating that the Energy Enhancer Patches do generate measurable changes in both biophoton emission intensities and body's energetic condition. With generally healthy subjects the changes induced appear to be in the desirable direction (i.e. improvement in body functions and a more relaxed state). However, the results of an unexpectedly mixed-in "unhealthy" subject suggest the possibility that generally healthy persons and unhealthy persons may respond very differently to the Energy Enhancer Patches.

More extensive study with a larger number of subjects incorporating the use of placebo patches is recommended to draw a more definitive conclusion.

I. Subjects & Test Sequence

Ten (10) nominally healthy male subjects were recruited from among CIHS students, staff and their friends and acquaintances. Each prospective subject was asked to carefully read and sign the “Informed Consent to Participate in a Clinical Research Study” form (IFC) and also fill out the “Health History Inventory” form (HHI). They were accepted as subjects for this study upon submission of the two signed forms. The specifics of subjects’ information are summarized in Table 1.

The information contained in the columns with the following headings “Name”, “Age”, “Health Condition”, “Medication” and “Others” of Table 1 were taken from the HHI form submitted by each subject. Blood pressure and heart rate were measured by a cuff system before and after the entire session (typically a 3 hours interval). The “Comments and Feelings after the Session” column shows how, after the entire session, each subject responded verbally when asked if he had felt anything in particular after the Energy Enhancer patches were applied on both of his soles.

The age of subjects ranged from 19.2 to 43.3 year old. They may be put into two groups, i.e., a Younger Group (19.2-27.3) and an Older Group (37.7-43.3). Although our plan was to have 10 healthy male subjects with no chronic health problems, it turned out that 2 subjects were under occasional medication as needed and one subject used medication every day. Their health conditions may or may not have influenced the effects of the patches. Hence, they are mentioned specifically here.

SC (age 25.0)

Infrequent heart palpitations. Takes Excedrin Migraine (2 tablets) when needed (less than 3 times a week).

FR (age 25.5)

Lower back pain & general back pain at work (works at Henry's). Occasionally takes Lozetopram (about twice a month).

TT (age 39.1)

Congestive heart failure in the past. High blood pressure. Takes Carvedilol 2/day, Diovan (160mg) 2/day, Aspirin 1/day.

TT, in particular, requires special attention as he is under daily medication for high blood pressure and cardiovascular problems (highlighted in blue in Table 1).

Of the remaining seven subjects, one subject (AR: age 43.3) may also deserve special

attention. He has been practicing Qigong and Meditation for many years, and seems to have developed unique physiological characteristics. He may have responded to the patches differently.

After the entire session each subject was asked if he felt anything in particular when and after the patches were put on their soles. Of the 10 subjects, 5 subjects felt “something” each in a different manner. Their comments, in the “Comment & Feeling after the session” column, are highlighted in yellow in Table 1. It is unclear whether these differences in subjective sensitivities are related to characteristics of the changes detected.

Table 1

Name	Age	Health condition	Medication		Blood pressure & Heart rate (times/min)		Comment & Feeling after the session	others
			taking currently	past 12months	Before	After		
WG	19.2	had respiratory tightness in around July 2009. Almost 100% recovered by now.		suffered from pain in stomach and colon (right side) a few months ago.	114 / 64, 64	115 / 63, 62	felt warmth propagating from feet to upper body, and then spreading throughout the whole body.	walks daily. Ashtanga Yoga 3-4 times weekly, body weight 155lb, 3 meals a day. 3-4 alcoholic beverages a week.
MF	21.6	no problem health history			146 / 80, 59	133 / 78, 59	felt nothing	body weight 160lb, 3 meals a day
MS	22.0	no problem health history			101 / 60, 61	97 / 66, 57	felt nothing	plays basketball 5-7 times a week, 1 hour each, body weight 155lb, 2 meals a day; he was awake all night driving a car until 5:00am. Slept in the morning before showing up for the afternoon session, but appeared very tired.
SC	25.0	infrequent heart palpitation	Excedrin Migraine 2 dosage when needed (less than 3 times a week)		130 / 84, 87	114 / 78, 78	felt left-right imbalance immediately after placing the white patch on right sole. It disappeared when the brown patch was placed on the left sole.	surfing 2 times a week, body weight 219lb, 3 meals a day, diet not varied enough, drink too often (3-5 times weekly)
FR	25.5	lower back pain & general back pain at work (works at Henry's)	Lozetopram, occasionally (about twice a month)		94 / 53, 50	98 / 64, 54	felt nothing	basketball, juggling, swimming twice a week, body weight 175lb, 2.5 meals a day
TL	27.3	no problem health history			124 / 74, 59	115 / 74, 47	felt energy propagating from feet to upper body and then, spread over the whole body.	practices Yoga 4 times a week, 90-120 minutes each time, plays basketball occasionally, body weight 150lb, 3 meals a day.
HB	37.7	no problem health history			112 / 76, 62	114 / 74, 60	felt sleepy during control, but became fully awake immediately after putting patches on.	surfing and running twice a week (for about 1 hour), body weight 170lb, 3-4 meals a day
TT	39.1	Congestive heart failure in the past, High blood pressure	Carvedilol 2/day, Diovan(160mg) 2/day, Aspirin 1/day	spironilactone	165 / 103, 62	184 / 114, 49	felt nothing	walking 30 min- 1 hour, 3-5 days a week, mild weight lifting 10-20 min / week, body weight 260lb, tries to eat healthily with occasional sweat and soda, 3 meals a day.
EP	43.1	no problem health history			133 / 90, 60	123 / 89, 63	fell asleep throughout the continuous AMI measurement.	skin near and around left Spleen meridian sei-point is thick and reddish color. Swimming and hiking, body weight 203lb, 2 meals a day
AR	43.3	Diabetes for a short time (more than 10 years ago). Learned meditation, then no longer have diabetes.			114 / 70, 86	114 / 72, 83	felt a sensation like a electric shock at left little finger when the patches were placed and felt like seeing a flash of light above the right side of the head.	meditation/prayer for 20-30 min once a week, surfing occasionally, body weight 200lb, 2 meals a day

Note: Subjects with yellow-highlighted comments subjectively felt "something" during the continuous AMI session with the patches on.

Test Sequence

Tests were scheduled with individual subjects either in the morning (9:00-12:00) or in the afternoon (14:00-17:00) during the period of October 12-30, 2009. Each session lasted approximately 3 hours and was conducted in the following sequence:

- A. Receiving signed IFC and HHI forms from the subject.
- B. Briefing the subject regarding the session procedures.
- C. Session sequence of tests:
 - 1. Blood Pressure & Heart Rate (“before patches”)
 - 2. Snapshot AMI (“before patches”)
 - 3. Biophoton (“before patches”)
 - 4. Continuous AMI & Polygraph (“before patches”: 15 min control measurement)
 - 5. Continuous AMI & Polygraph (“with patches”: 30 min test measurement)
 - 6. Biophoton (“with patches”)
 - 7. Snapshot AMI (“with patches”)
 - 8. Blood Pressure & Heart Rate (“with patches”)
 - 9. Removing the patches
 - 10. Paying \$50 cash to the subject and getting the receipt signed.

All of the above were performed in Lab 1 (AMI lab) except the biophoton tests which were performed in Lab 2. Therefore, for each biophoton test the subject was asked to walk for about 30 feet to Lab 2 and walk back to Lab 1 after the test.

II. Results

1. Biophoton Emission Test

The palm of the right hand was chosen as the target skin surface for biophoton detection. This choice was made primarily to ensure good repeatability of alignment with respect to the photon sensing device as well as in consideration of the ease of holding the hand stably in position throughout the “Hand in” period of the test.

1) Instrumental Set-up

The photon detection system was comprised of a Hamamatsu photomultiplier tube Model H6180-01 Photon Counting Head ("PMT"), the Fluke Model PM6690 Counter/Analyzer, and the Fluke Time View 90W software (which runs on Windows-based PC) for data collection and analysis. The PMT has a circular photosensitive area of 15mm in diameter and a spectral sensitivity range of 300-650nm in the visible spectrum.

The PMT was installed at one end of a rectangular dark box (10"x20"x35") with its entire surface (inside and outside) painted in black to minimize multiple reflections of photons. The dark box had a circular hole on one side with a black curtain covering it. This set up allows the subject's right arm to be inserted inside in such a way that the palm is stably held perpendicular to the axis of the PMT tube and the palm's surface is kept at a distance of ~3 cm from the PMT's photon collecting window. This alignment of the subject's hand was facilitated by a combination of a depth position marker at which the subject's little finger stopped and a distance positioning rod installed on the wall of the dark box and protruding in parallel to the axis of the PMT. The subject's palm was held in position such that the tip of the rod lightly touched the upper rim of his palm near the base of the index finger. The PMT, powered by a 5V DC regulated power supply, has built-in electronics to amplify and shape the output pulses to impedance-match the 50 Ω input impedance of the PM6690 Counter/Analyzer. The counter/analyzer was run in the frequency mode with the sampling window set to 1 sec, thereby counting the number of pulses every second consecutively. The counter/analyzer sends data, in the form of time-series, to the Time View 90W software which progressively displays a trend graph of the PMT output pulses in counts/sec (cps) during the entire test session. The Time View 90W software creates a time-series data file for each test and stores this file in the PC's hard disk. Data files were later converted into Excel format, as needed, and further analyzed by Excel statistical tools.

The dark box - PMT system was placed on a wooden table. A small stool was placed at the side of the table to enable subjects to sit during the test session. These items were contained inside the light-tight EMI-shielded room (Model 14-6/7-0 Faraday Cage) manufactured by Lindgren RF Enclosures company. The regulated power supply, counter/analyzer, PC and a printer were installed on a lab bench outside the Faraday cage. Electrical connections between inside and outside the Faraday cage were established via BNC connectors mounted on the side wall of the Faraday cage. During the test, verbal

communication between the subject inside and the experimenter outside was enabled by a battery-operated interphone. The entire set-up is schematically shown in Fig. 1 below.

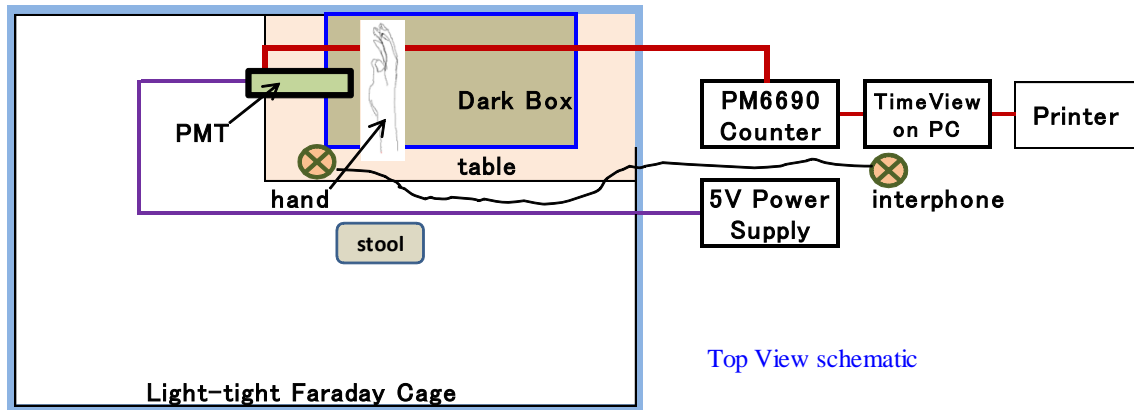


Fig. 1 Instrumental set-up Schematic

2) Test Protocol

The PMT has a cap for closure of its photon collecting window. It needs to be manually screwed off to open the detector for photon detection. When monitored with the cap on (i.e., PMT window closed), the dark count detected (internally generated by the PMT, an unavoidable quantum mechanical effect) was typically around 20 cps at room temperature. This dark count slowly varied over hours in the range of 16-27 cps, presumably influenced by the ambient conditions such as temperature and humidity. In order to keep the PMT in check on the uncontrollable slow variation of this dark count during the test session, the Test Protocol included brief (1 min) dark count measurement periods at the beginning and at the end of the test session. The sequence of events during the biophoton test was as follows:

1. The experimenter explains to the subject the test procedures including instruction as to how the hand should be inserted and positioned stably in front of the PMT window.
2. The experimenter closes the door of the Faraday cage and tells the subject to sit relaxed doing nothing, and starts recording the PMT output on the Time View 90W software for 1 minute. (**PMT closed 1**)
3. After 1 minute, the experimenter opens the door, enters the Faraday cage, and unscrews the PMT cap to open the photomultiplier window. Then he covers the dark box hole with the black curtain, comes out and closes the door. The subject remains quietly sitting on the stool doing nothing as in 2 above while the software

- continues monitoring the PMT output for 2 minutes. (“**PMT Open 1**”)
4. After the 2-minute period, the experimenter tells the subject to insert his right arm into the dark box and to position his palm in front of the PMT window as instructed. The software continues monitoring the PMT output with the subject’s hand in front of the PMT window for 5 minutes. (“**Hand in**”)
 5. After 5 minutes, the experimenter asks the subject to remove his hand from the dark box and to close the dark box curtain while the software continues monitoring the PMT output for 2 minutes. (“**PMT Open 2**”)
 6. After that 2-minute period, the experimenter opens the door, re-enters the Faraday cage and screws on the cap to close the PMT window. The subject remains quiet inside. The experimenter comes out while the software continues monitoring the PMT output for 1 minute. (“**PMT closed 2**”)
 7. After that 1-minute period, the session is over. The experimenter stops the recording of the PMT output, saves the data file and opens the door of the Faraday cage, signaling the end of the session and asking the subject to come out.

A schematic recording of the above protocol is shown in Fig. 2 below along with an example of an actual result for subject WG (Fig. 3).

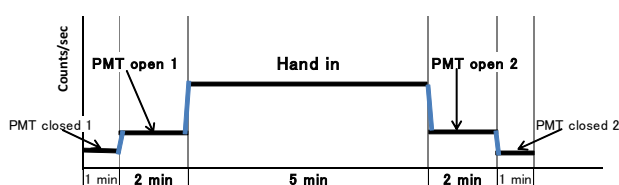


Fig. 2

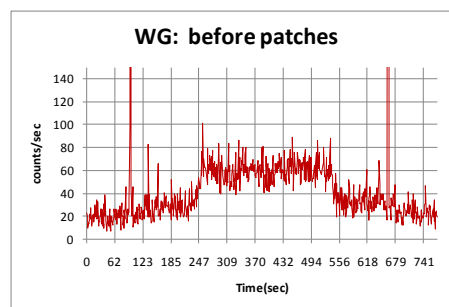


Fig. 3

The two “over scale” peaks in the graph correspond to the moments when the door of the Faraday cage was opened by the experimenter during the test session as described above.

For each individual subject the test session with this protocol was performed twice, after the 1st Snapshot AMI test (i.e., “before patches”) and after the continuous AMI test (“with patches”). The results obtained “before patches” and “with patches” were compared and the difference was analyzed and statistically evaluated for each individual subject.

Graphs of the “before patches” test and the “with patches” test for each subject smoothed by a 10-point moving average and the raw data graphs are presented in APPENDIX 1 and APPENDIX 2 respectively.

3) Data Analysis and Results

Assuming that the PMT’s dark count and signals triggered by incident photons (biophotons from subject’s right palm and ambient stray photons) are linearly additive phenomena, Biophoton Emission (BE) from the subject’s palm was defined by:

$$\text{BE} = \text{“Hand in” count} - \text{“PMT open” count}$$

The difference in BE between “before patches” and “with patches” was then analyzed and evaluated by the following procedure.

1: Taking the data points for analysis from relevant segments on the Graph.

One hundred and ten (110) consecutive data points were taken from “PMT open 1” and “PMT open 2” segments away from the tails of the large peaks caused by the door opening. They were put together as the “PMT open” data group with a total of 220 data points. Similarly 295 consecutive data points were taken from the “Hand in” segment as the “Hand in” group. (See Fig. 2 for a visual representation of those segments.)

On closer scrutiny of each data segment, it was noted that there are a small number of anomalously large spikes which are regarded as spontaneous bursts of PMT current pulses unrelated to biophoton emission. For proper statistical evaluation, these anomalies were excluded from analysis. From visual observation, it seemed an effective way to remove those anomalies if upper and lower limits were set to discriminate acceptable peak amplitudes. These upper and lower limits were set at $\pm 3\sigma$, where σ is the standard deviation. The few data points that lied outside the two limits were removed as spurious “outliers”, which might otherwise have distorted the results of statistical evaluations.

For analysis purposes, data groups were defined by applying this process for all test session results, and they were subjected to statistical evaluations of “before patches” versus “with patches” differences in two ways as described below.

2: “before patches” versus “with patches”-- Analysis by Method 1

In Method 1 BE was calculated as the difference between the means of the “Hand in” data group and the “PMT open” data group. One example of this process is shown Fig. 4 below.

Data: G28–240, H28–313					
t-Test: Two-Sample Assuming Unequal Variances					
	Variable 1	Variable 2	PMT open 1&2		Hand in
Mean	30.04803	59.8420596	Var1-Mean	30.0	Var2-Mean 59.8
Variance	82.79385	100.557431	Var1-SD	9.1	Var2-SD 10.0
Observations	213	286	Var1-SEM	0.62	Var2-SEM 0.59
Hypothesized	0		Var1-Max	30.7	Var2-Max 60.4
df	478		Var1-Min	29.4	Var2-Min 59.2
t Stat	-34.6278		Bef-Mean	29.8	
P(T<=t) one	1.1E-132		Bef-Max	31.0	
t Critical one	1.648048		Bef-Min	28.6	
P(T<=t) two	2.2E-132				
t Critical two	1.964939				

Fig. 4 Example of calculations for biophoton emission of one subject

In Fig. 4, “Variable 1” means the “PMT open” data group which was defined by combining “PMT open 1” and “PMT open 2” segments and removing outliers (it has 213 data points in this example). “Variable 2” means the “Hand in” data group with outliers removed (it has 286 data points in this example).

T-tests for unequal variances were performed to check on the significance of the change between the “PMT open” segment and the “Hand in” segment with very significant results indeed, for every subject. The result of the t-test for this particular example is shown on the left side of Fig. 4, along with the mean and variance of each data group in the middle and the right side of the figure.

As a measure of the error range for each of the means obtained, the Standard Error of the Mean (SEM) was also calculated. Each mean value is then expressed with its error range as “Mean ± SEM”. Biophoton emission is determined as the difference between the two means with their respective error range. The three numbers shown in the lower middle of Fig. 4 are the following.

$$*Bef-Mean = [\text{Mean of “Hand in” group}] - [\text{Mean of “PMT open” group}]$$

$$*Bef-Max = [(\text{Mean of “Hand in” group}) + \text{SEM}] - [(\text{Mean of “PMT open” group}) - \text{SEM}]$$

$$*Bef-Min = [(\text{Mean of “Hand in” group}) - \text{SEM}] - [(\text{Mean of “PMT open” group}) + \text{SEM}]$$

This calculation was performed on all test sessions (i.e., “before patches” and “with patches”) for all the subjects. The results are summarized in Table 2 below.

Subject	Age	Before Patches			With Patches			(Aft-M) - (Bef-M)	(Aft-Max) - (Bef-Min)	(Aft-Min) - (Bef-Max)
		Bef-Mean	Bef-Max	Bef-Min	Aft-Mean	Aft-Max	Aft-Min			
WG	19.2	29.8	31.0	28.6	16.6	17.6	15.6	-13.2	-11.0	-15.4
MF	21.6	16.4	17.2	15.7	8.0	8.7	7.2	-8.5	-7.0	-10.0
MS	22.0	34.4	35.6	33.2	32.1	33.4	30.8	-2.3	0.2	-4.8
SC	25.0	25.8	27.0	24.5	13.5	14.4	12.6	-12.3	-10.1	-14.5
FR	25.5	17.2	18.3	16.0	1.5	2.4	0.6	-15.7	-13.6	-17.7
TL	27.3	19.4	20.6	18.2	10.6	11.4	9.7	-8.8	-6.8	-10.9
HB	37.7	15.6	16.7	14.5	10.3	11.5	9.1	-5.3	-3.0	-7.6
TT	39.1	20.0	21.1	18.9	22.0	23.5	20.4	1.9	4.6	-0.7
EP	43.1	21.7	22.8	20.6	16.8	18.0	15.6	-4.9	-2.7	-7.2
AR	43.3	39.9	41.2	38.7	33.6	35.0	32.2	-6.3	-3.7	-9.0

Table 2: Results of analysis by Method 1

The difference in BE between “with patches” and “before patches” is determined by taking the difference between the cells in the “before patches” column and the “with patches” column for each subject. Of the 10 subjects only two (MS and TT) are marginally positive or negative with virtually no significant change between “with patches” and “before patches”. All other subjects showed a decrease in BE with the patches on for about 40 minutes. The rate of decrease varied from 15% to 90% depending on the subject. Fig. 5 shows the results plotted against subject’s age.

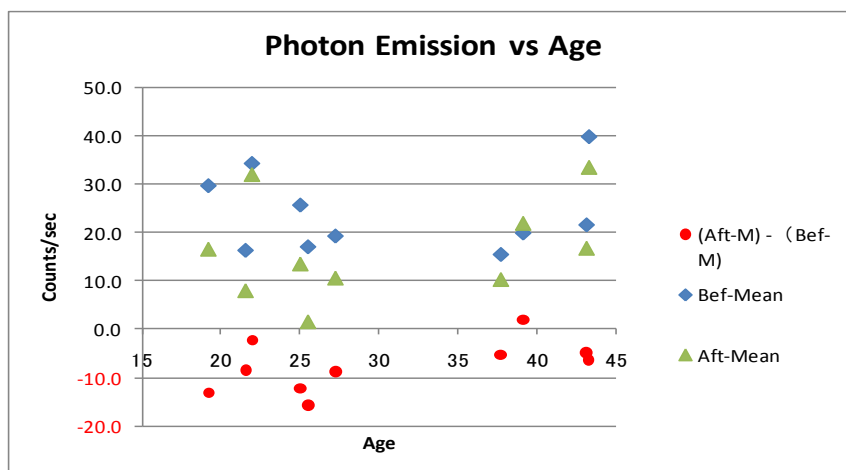


Fig. 5

From the table and the graph it appears that the younger group has a tendency to show a greater decrease than the older group. When a t-test was applied to the [(Aft-M)-(Bef-M)] data sets of the two groups, with p=0.05 as the preset significance level, the result turned out to be significant with p=0.043 as shown in Fig. 6.

Mean Value t-test between Younger & Older groups				
Young Grp	Older Grp	t-Test: Two-Sample Assuming Unequal Variances		
-13.2	-5.3			
-8.5	1.9		Variable 1	Variable 2
-2.3	-6.3	Mean	-10.1213	-3.65649
-12.3	-4.9	Variance	22.04856	14.26959
-15.7		Observations	6	4
-8.8		Hypothesized Mean Difference	0	
Note:		df	8	
Younger Grp: <30yrs old		t Stat	-2.40229	
Older Grp: .35yrs old		P(T<=t) one-tail	0.021511	
		t Critical one-tail	1.859548	
		P(T<=t) two-tail	0.04302	
		t Critical two-tail	2.306004	

Fig. 6 t-test results between the Younger Group and the Older Group

The number of samples in each group is small. Therefore, this result should be taken with due caution. Nevertheless, it does encourage further study on the correlation between the decrease in biophoton emission and age.

3: “before patches” versus “with patches” -- Analysis by Method 2

In Method 2, two data point groups were first determined by the following procedure:

- 1) 100 consecutive data points were taken from the “PMT open 1” segment nearer the starting edge of the “Hand in” segment. This defined the “PMT open” group with 100 data points.
- 2) 100 consecutive data points were taken from the “Hand in” segment nearer its ending edge. This defined the “Hand in” group with equal (=100) number of data points.
- 3) The two sets of 100 consecutive data points obtained by 1) and 2) were treated as “pairs”, and differences were calculated for each of 100 pairs, which yielded a group of 100 BE data points for each test session.
- 4) 100 BE data points were thus generated for the “before patches” and the “with patches” test sessions for each individual subject.
- 5) Then, the “before patches” data group and the “with patches” data group, each having 100 BE data points, were treated as groups of 100 “paired samples” and a t-test for paired samples was applied to evaluate the significance of the “with patches” vs “before patches” difference.

Note:

Spurious “outliers” were removed in the same way as in Method 1 prior to taking 100

consecutive data points in 1) and 2) above.

In this process the 100 data points determined in steps 1), 2), 3) and 4) described above are not genuinely “paired” in reality. Taking differences between unrelated pairs tend to increase the variance in statistical handling. However, the means should remain the same theoretically. This statistical test may be regarded to be more stringent in getting statistically significant results. This is indeed the case as summarized in Table 3 below.

Subject	Age	2009/10/20 Before Patches		With Patches		Changes (with)-(before)	P-value 2-tail	Comment
		n	~ Before Variance	n	~ With Variance			
WG	19.2	35.1	183.9	18.2	116.4	-16.9	4.3E-17	significant
MF	21.6	16.5	80.8	6.7	71.4	-9.8	2.8E-11	significant
MS	22.0	31.9	161.7	31.4	183.6	-0.5	7.8E-01	not significant
SC	25.0	25.2	161.5	13.7	101.0	-11.5	3.2E-11	significant
FR	25.5	22.2	118.8	4.1	66.1	-18.1	4.2E-24	significant
TL	27.3	19.3	166.5	10.2	83.9	-9.1	5.4E-08	significant
HB	37.7	13.7	174.8	9.9	167.6	-3.8	5.2E-02	marginal
TT	39.1	20.7	158.3	23.4	290.8	2.7	2.1E-01	not significant
EP	43.1	21.3	144.5	16.7	150.6	-4.7	6.2E-03	significant
AR	43.3	40.1	241.7	27.3	244.8	-12.8	2.0E-07	significant

Table 3: Results of analysis by Method 2

Of the 10 subjects 7 subjects showed a statistically significant decrease in biophoton emission with p values ranging from significant (p=0.0062) to extremely significant (p=4.2x10⁻²⁴). Of the remaining 3 subjects one showed a decrease with p=0.052, close to the preset criteria (p=0.05). No statistical significance was found with the other two subjects. They are MS and TT. Overall this result is consistent with the result obtained by Method 1.

Fig. 7 shows the plot of (“with patches”)- (“before patches”) against the age of subjects. A t-test was performed to compare the younger group and the older group as in the case of Method 1. However, the result was not statistically significant this time (Fig. 8). Upon closer observation, it is apparent that AR’s result is noticeably different from the rest of the other subjects in the Older group. AR is the subject who has been practicing Qigong and meditation for many years. This fact may be related to the different result obtained with AR. Indeed if AR is excluded from the Older group, a t-test with unequal variances gives a significant result (p=0.04; Fig. 9).

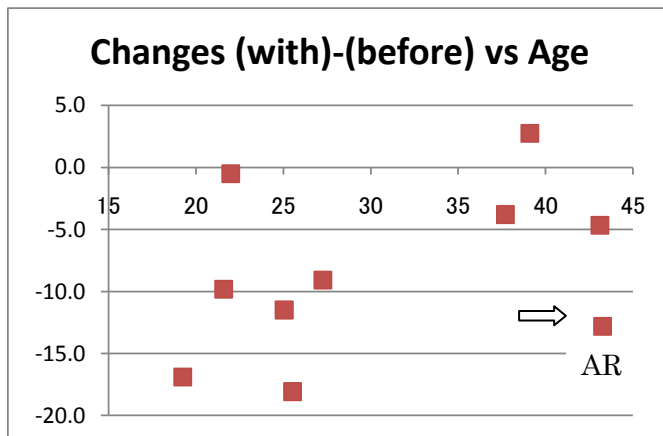


Fig. 7 (with)-(before) Change vs Age

Young Grp	Older Grp
-16.9	-3.8
-9.8	2.7
-0.5	-4.7
-11.5	-12.8
-18.1	
-9.1	

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	Variable 2
Mean	-10.979558	-4.62948
Variance	40.0395073	40.68031
Observations	6	4
Hypothesized	0	
df	7	
t Stat	-1.5472677	
P(T<=t) one-	0.08286131	
t Critical one-	1.8945786	
P(T<=t) two-	0.16572261	not significant
t Critical two-	2.36462425	

Fig. 8 t-test result between the 2 age groups

AR excluded from Older group

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	Variable 2
	変数 1	変数 2
Mean	-10.979558	-1.90306
Variance	40.0395073	16.42037
Observations	6	3
Hypothesized	0	
df	6	
t Stat	-2.6042888	
P(T<=t) one-	0.02021447	
t Critical one-	1.94318027	
P(T<=t) two-	0.0404289	
t Critical two-	2.44691185	

Fig. 9 Same t-test result with AR excluded

4) Discussion

Although the choice of data segments and the approach of analysis were different, the results obtained by the two Methods of analysis were found to be largely consistent with each other. Seven subjects out of ten showed a statistically significant decrease in BE between “before patches” and “with patches”. With three subjects the change was found small and not statistically significant. None of the subjects showed significant increase. This observation implies that the application of the Energy Enhancer Patches to the Kidney #1 points on the soles tend to cause the biophoton emission from the palm of the right hand to decrease.

What this means in terms of effects on the body's physiology or energy systems is unclear at this moment. However, there are several publications in the literature indicating, although inconclusive, that unhealthy persons emit more biophotons,⁽¹⁾ that the skin of unhealthy body parts emits more biophotons but BE decreases after treatment,⁽²⁾ that elderly persons emit more biophotons⁽³⁾, and so on. Furthermore, intra and inter cellular coherence fields have been proposed as mechanisms for biophoton emission from living tissues.⁽⁴⁾ Unhealthy tissues, e.g., cancer, are known to lack coherence and emit more biophotons than healthy tissues. Therefore, the decrease in biophoton emission may be interpreted as a shift to a more desirable health condition.

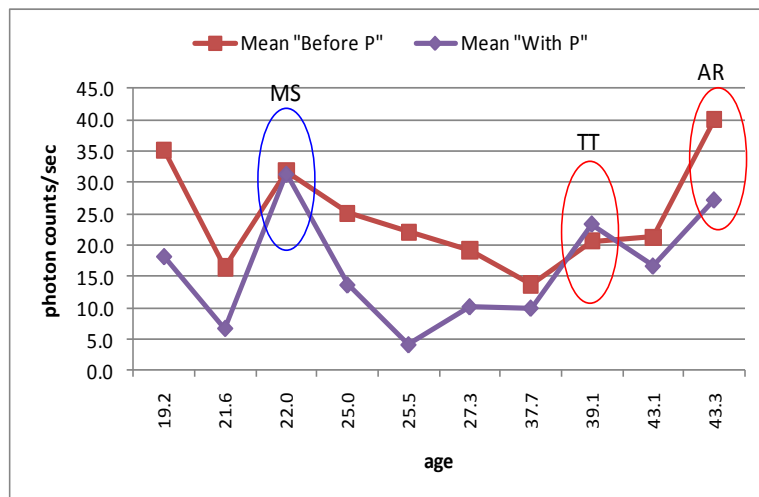


Fig. 10 “before patches” and “with patches” vs Age

Results from two subjects appear to be different from the rest. Fig. 10 shows a plot of the biophoton emission values given in Table 3. AR is the oldest subject tested. His biophoton emission “before patches” is the highest at ~40 cps, whereas the three others above the age of 35 have smaller biophoton emissions, in the range 14~21 cps. In AR’s case the decrease “with the patches” is ~12 cps, which is as large as decreases seen with younger subjects, whereas the three others older subjects showed much smaller decreases. This unique behavior of AR’s result might be related to years of Qigong and meditation practice. Namely, Qigong practice may have kept his body system as vital as younger subjects.

TT is the only subject who yielded an increase “with patches”, although not statistically significant. Nevertheless, his result appears somewhat different from the others. The probability for this observation of “increase” to occur with this particular subject TT, who

happens to be under daily medication, is ~1/100. Therefore, it is very possible that his result has something to do with the fact that he is currently taking medicine for high blood pressure and cardiovascular problem every day.

Of the Younger group, MS is the only one who did not show a statistically significant decrease. It is unclear why this was so. However, later we were informed that he stayed up all night driving a car until 5:00AM. He then slept in the morning and showed up for the afternoon test session, but was feeling very tired. This particular condition of his on that test day might have affected his result.

2. Snapshot AMI Test

Two types of AMI measuring systems were utilized in this study. One is the “Snapshot AMI,” which captures basic meridian information at the particular moment of measurement. The other is the “Continuous AMI” which monitors meridian conditions continuously throughout the experiment. These two AMI measuring systems detect the electro-dermal properties at special meridian points located near the nail bed of fingers and toes called “Sei-points” which are the terminal points of meridians corresponding to certain internal organs. Altogether 14 main meridians are measured by these two systems. The names of the 14 meridians in the present study are abbreviated according to international agreements as follows: lung meridian as **LU**; large intestine meridian as **LI**; stomach meridian as **ST**; spleen meridian as **SP**; heart meridian as **HT**; small intestine meridian as **SI**; urinary bladder meridian as **BL**; kidney meridian as **KI**; pericardium (heart constrictor) meridian as **PC**; triple heater meridian as **TE**; gall bladder meridian as **GB**; liver meridian as **LV**; diaphragm meridian as **DI**; stomach branch meridian as **ST**. All of these meridians are bilateral so that the total number of Sei-points measured is 28.

Both AMI devices perform measurements by applying a Single Square Voltage Pulse (SSVP) and extract three independent parameters; “BP (Before Polarization)”, “AP (After Polarization)” and “IQ (total electrical charge)”. BP is the parameter for meridian function and Ki-energy flow. AP is related to the function of the autonomic nervous system. IQ reflects metabolic function as well as the immune system.

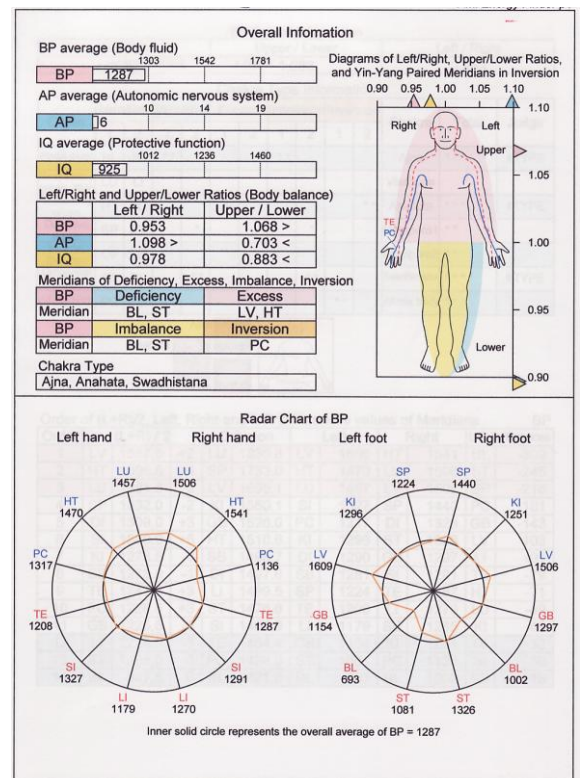
1) **Snapshot AMI Measurements**

Before starting the experiment and after finishing all tests, snapshot AMI measurements were performed in order to record the subject’s meridians condition “before” and “after” the entire session.

First, the subject was requested to remove his shoes and socks and to relax while sitting on a chair. Next, two Ag/AgCl non-active 36 mm-diameter adhesive patches were attached one to the subject’s left forearm and the other to the right forearm, approximately two inches away from each wrist. One Ag/AgCl active square electrode ($7 \times 7 \text{ mm}^2$) was attached to each of the 28 Sei-points. Then, after placing those electrodes, the subject was asked to keep a relaxed position on the chair for about 10 minutes. This period is needed to stabilize the electrical contact between the electrodes and the skin. The experimenter then performed the measurement by touching each active electrode on the Sei-points with the AMI probe sequentially. The sequence of data acquisition is pre-programmed by the software, e.g., it begins from the LU meridian Sei-point on the thumb to the SI meridian Sei-point on the small finger (left hand first) and then from the SP meridian Sei-point on the big toe to the BL meridian Sei-point on the little toe (left foot first). BP, AP and IQ, obtained for each Sei-point, are processed and analyzed by the AMI software and the result is printed

out in the form of diagrams, charts and tables.

The picture on the right shows an example of the first page of the AMI data display on the computer. The table, diagram and charts on the data display presents the values of BP, AP, and IQ in terms of the average of 28 data points and ratios of left/right and upper/lower half of the body indicating the overall conditions of the subject. In addition, parameters related to meridian dysfunctions in Ki energy flow (Deficiency, Excess, Imbalance, Inversion) as well as the subject's Chakra Type are listed. The BP values of each meridian in the upper and lower body are also shown in radial chart format to facilitate visual grasp of meridian imbalances.



2) Results

Before and after the session, for each of the 3 AMI parameters (BP, AP and IQ) and for each subject, the average of the 28 Sei-points measured was computed. Then, from the average values of the 10 subjects, the Mean and Standard Error of the Mean (SEM) were calculated. This is presented for BP, AP and IQ “before patches” and “with patches” in bar graphs (Figs. 11, 12, 13).

Fig. 11 shows that the Mean (\pm SEM) of BP decreased from $1981.3 \pm 84.2 \mu\text{A}$ to $1943.8 \pm 103.1 \mu\text{A}$ after placing the patches, which is a 2% reduction. In addition, a two-tailed t-test for paired samples was performed to determine whether there is a significant difference in the mean BP values between “before patches” and “with patches”. No significant difference was found ($p = 0.163$).

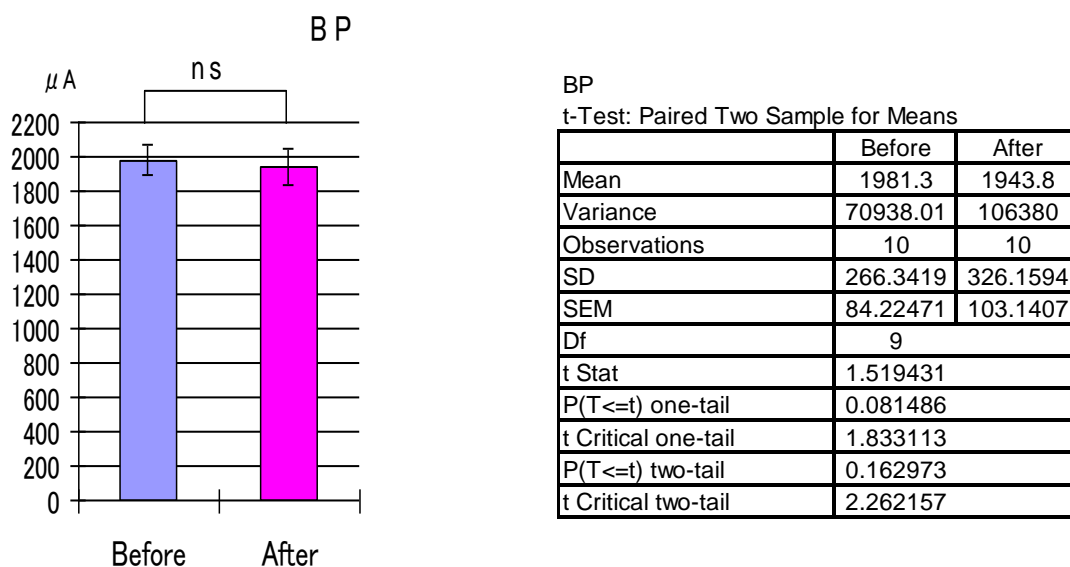


Fig. 11

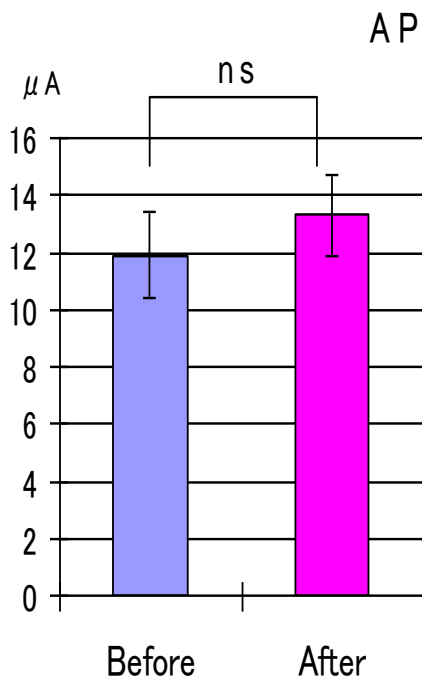
In order to examine if there was significant changes in individual meridians between “before patches” and “with patches”, two-tailed paired t-tests were performed for each meridian. For the first step, left/right average BP values were taken from the results of all the subjects meridian by meridian. This grouping of BP values for each of the 14 meridians was done for “before patches” and “with patches”. Then, BP values of the two groups were compared statistically by means of a t-test.

The p-values obtained from the t-tests for all the meridians are summarized in Table 4. It indicates that there is no significant difference in any meridian between “before patches” and “with patches”. However, the heart and small intestine meridians gave p values much closer to $p=0.05$ than all other meridians. It is to be noted that these two meridians form a Yin-Yang meridian pair in the theory of Traditional Chinese Medicine. The probability for this pairing to occur by chance alone is $1/91$ (~ 0.01). Therefore, this particular result is likely to mean something important indicating the effect of the patches. Changes are both for the decrease. It may be that the Ki-energies in the Heart and Small Intestine meridians shift downward more significantly than in other meridians in response to the application of the patches.

LU	LI	PC	DI	TE	HT	SI
0.137156	0.29149	0.390341	0.310462	0.454086	0.077721	0.05194
SP	LV	ST	SB	GB	KI	BL
0.725895	0.924593	0.515292	0.981233	0.902292	0.436529	0.219929

Table 4: Probabilities of t-test for each meridian for 10 subjects

In contrast to BP, the Mean (\pm SEM) of AP values increased from $11.9 \pm 1.48 \mu\text{A}$ (“before patches”) to $13.3 \pm 1.41 \mu\text{A}$ (“with patches”), an increase of 12% (Fig. 12). However, a two-tailed paired t-test showed no significant difference between “before patches” and “with patches” ($p=0.218$). This is not unexpected because AP is the most variable of the three AMI parameters. Because of the large variance and absence of specificity, statistical analysis by individual meridians was not performed.

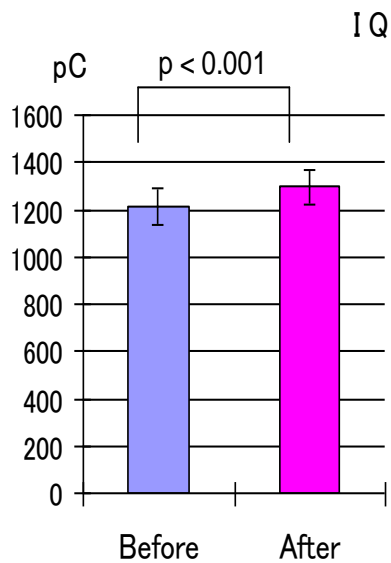


AP
t-Test: Paired Two Sample for Means

	Before	After
Mean	11.9	13.3
Variance	21.87778	20.01111
Observations	10	10
SD	4.677369	4.473378
SEM	1.479114	1.414606
Df	9	
t Stat	1.325508	
P(T<=t) one-tail	0.108831	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.217662	
t Critical two-tail	2.262157	

Fig. 12

With respect to IQ, the Mean (\pm SEM) after applying the patches (1295.4 ± 76.6 pC) was greater than that before the patches (1212.3 ± 76.0 pC). There was a significant increase ($p < 0.001$) of IQ values between “before patches” and “with patches” (fig. 13). The rate of increase was 7%.



IQ		
t-Test: Paired Two Sample for Means		
	Before	After
Mean	1212.3	1295.4
Variance	58604.01	57829.82
Observations	10	10
SD	242.0827	240.4783
SEM	76.55326	76.04592
df	9	
t Stat	5.063466	
P(T<=t) one-tail	0.000339	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.000678	
t Critical two-tail	2.262157	

Fig. 13

To check whether there was any significant difference between “before patches” and “with patches”, two-tailed paired t-tests were performed for each individual meridian. The data analysis process is the same as in the case for BP described above. The p-values calculated are summarized in Table 5.

LU	LI	PC	DI	TE	HT	SI
0.062654	0.010951	0.069358	0.003585	0.149594	0.014616	0.622926
SP	LV	ST	SB	GB	KI	BL
0.018092	0.015108	0.082435	0.02621	0.053102	0.257104	0.167253

Table 5: Probabilities of t-test for each meridian for 10 subjects

There are significant increases ($p < 0.05$) in the mean IQ values of some specific meridians (highlighted yellow in the table). They are LI, DI and HT in the upper body and SP, LV and SB in the lower body. Mean values for LU, PC, ST and GB meridians (colored green in the

table) also show relatively large increases “with patches”, although their p-values do not reach the significance criteria. If an “a priori” increase is assumed and one tailed t-test is applied rather than two-tailed test, LU, PC, ST and GB meridians would also show statistically significant results. This result implies that, although the patches were applied to Kidney #1 points, the effects appear to have spread to the entire body system via the Kidney meridian.

Next, how the body energy balance changed between “before patches” and “with patches” was examined. Table 6 lists ratios between the upper and lower half of the body for BP, AP and IQ before and after wearing the patches calculated for all subjects. If the ratio > 1, it means that the balance is shifted toward the upper body and vice versa. The ratios of each parameter vary from subject to subject.

Subject (initial)	BP		AP		IQ	
	Upper/Lower		Upper/Lower		Upper/Lower	
	Before	After	Before	After	Before	After
WG	1.047	0.984	1.327	1.370	1.118	1.083
MF	1.039	0.922	1.460	0.662	1.100	0.966
MS	1.121	1.093	1.152	1.328	1.611	1.446
SC	1.037	0.980	1.239	1.291	0.856	0.839
FR	1.058	0.989	1.319	1.316	1.229	1.200
TL	0.968	1.068	1.037	0.963	1.025	1.012
HB	0.953	0.851	0.775	0.689	0.993	0.871
TT	0.938	1.061	2.497	1.582	0.945	1.038
EP	1.065	1.061	0.582	0.561	0.864	0.853
AR	1.083	1.070	1.200	0.922	0.815	0.882

Table 6: Ratios between the upper and lower half of the body

There appear to be differences in frequency of occurrence, i.e., cases where the ratio

decreased and where it increased between “before patches” and “with patches”. The number of either increases or decreases was counted for each parameter as shown in Table 7. Then, a Chi-square test was performed in order to investigate whether there was a significant difference in frequency of occurrence.

BP	AP	IQ												
<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Decrease</td> <td>increase</td> </tr> <tr> <td>8</td> <td>2</td> </tr> </table>	Decrease	increase	8	2	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>decrease</td> <td>increase</td> </tr> <tr> <td>7</td> <td>3</td> </tr> </table>	decrease	increase	7	3	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>decrease</td> <td>increase</td> </tr> <tr> <td>8</td> <td>2</td> </tr> </table>	decrease	increase	8	2
Decrease	increase													
8	2													
decrease	increase													
7	3													
decrease	increase													
8	2													
$p = 0.058$	$p = 0.206$	$p = 0.058$												

Table 7: Chi-square test on the number of increases or decreases in Upper/Lower ratios

Although the p-values are larger than the preset criteria (0.05), hence statistically not significant, the frequency in the “decrease” case is much greater than that of the “increase” case for the three parameters. This implies that the balance had a tendency to shift toward the lower body in all of body’s energy functions.

3) Discussion

With respect to BP values, which are related to the flow of Ki-energy, the averages of BP over all the ten subjects did not show a significant increase or decrease, which implies that the overall Ki-energy level was not affected by the patches in this study. No significant change was found in any individual meridian, either. Visual observation of the meridian radial charts of all the subjects before and with patches was carefully performed. However, no common shift pattern ascribable to the patches was recognized.

On the contrary, the mean IQ of the 14 meridians increased significantly after wearing the patches, indicating an enhancement of the immune system activity. In particular, the increases in HT, DI and LI meridians in the upper body and SP, LV and SB meridians in the lower body were found to be statistically significant. Those meridians relate to the function of circulatory and digestive organs. They may be interpreted as effects induced by the patches.

The balance between the upper and the lower half of the body, i.e. upper/lower ratios, showed a tendency to decrease in all the three parameters. This implies that the balance of the body's energy activities shifted toward the lower body. These energy shifts are most probably due to the fact that the patches were attached to the lower extremities.

2. Continuous AMI Test

1) Continuous AMI Measurement

The continuous AMI measurement system consists of the snapshot AMI device and switching electronics, which automatically repeats the entire 28 Sei-point measurement sequence every 5 sec and enables quasi-continuous monitoring of all the 28 Sei-points.

After AMI snapshot and biophoton first tests, and prior to the tests "with patches", continuous AMI measurements were performed to examine whether any specific changes in meridian functions are induced by application of the patches. All three AMI parameters (BP, AP, and IQ) were monitored simultaneously on all 28 Sei-points, so 28 time-series data were recorded for each parameter and for each subject. Therefore, for this study, the total

number of recordings for the ten subjects amounted to 280 time-series recordings for BP alone. Several selected cases from the whole collection of time-series data are featured below.

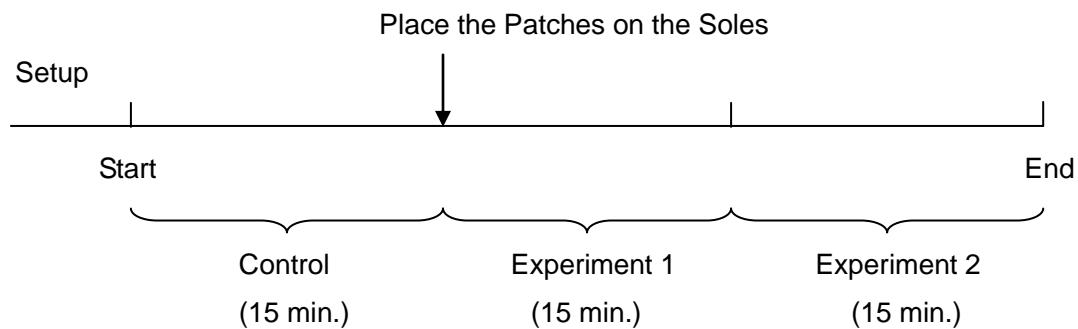
2) Test Protocol

Conventional electrophysiological parameters such as ECG, PPG and respiration were also recorded by a Polygraph system to obtain supplementary information of each subject's condition. In addition a video recording was performed on the subject to monitor any physical body movements during the test session, which may have caused artifacts in AMI recording patterns. The continuous AMI measurement was performed along with the Polygraph and video recordings using the following test protocol:

1. Attach the active electrodes to all Sei-points firmly with medical tape.
2. Before starting the measurement, check the recorded data of all Sei-points and ensure that all electrical connections are good and stable.
3. Start the continuous AMI measurement, the Polygraph system and the video camera at the same time. Continue monitoring for 15 minutes as "control".
4. 15 minutes later, apply two patches to acupuncture point #1 of the Kidney meridian on the soles: one patch colored white on the right sole and the other patch, colored tan, on the left sole.
5. Continue monitoring for an additional 30 minutes (the first 15 min. is called "Experiment 1," and the second 15 min. is called "Experiment 2").

6. Stop the whole continuous measurements 30 minutes after placing the patches and save the data into computer.

Schematic diagram of Protocol for the continuous measurements:



All 28 BP parameters were displayed continuously on the computer screen throughout the test session. The patches were placed on both soles after the 15 minute control period. The total experiment time was therefore 45 minutes as shown in the above schematic diagram.

3) **Results**

The following graphs were created from the results on the continuous AMI recordings by using a 10-point simple moving average to smooth out short term fluctuations of the raw data. Those graphs represent some featured meridian condition for certain persons out of ten subjects showing a characteristic trend on the change of their Ki-energy levels. Fig. 14 and Fig. 15 are graphs showing different trends of BP in the upper body such as TE and LU meridians, whereas Fig. 16 and Fig. 17 are those of the lower body such as KI and GB meridians.

In the upper body, as can be observed from Fig. 14, BP values declined in most of the cases by about 3 -5% for both the left and right sides of the meridian after placing the patches. To the contrary, a peculiar case also can be seen that BP started to increase right after placing the patches by about 5%, as shown in Fig. 15.

Looking at graphs of the recordings, it can be seen that BP changes of six subjects out of ten were a decrease, whereas those of three subjects showed an increase (one had no apparent change). This is only a qualitative classification by visual observation of the graphs. The trend of BP behaviors in the upper body varied in magnitudes and patterns from subject to subject within the period of 30 min with the patches.

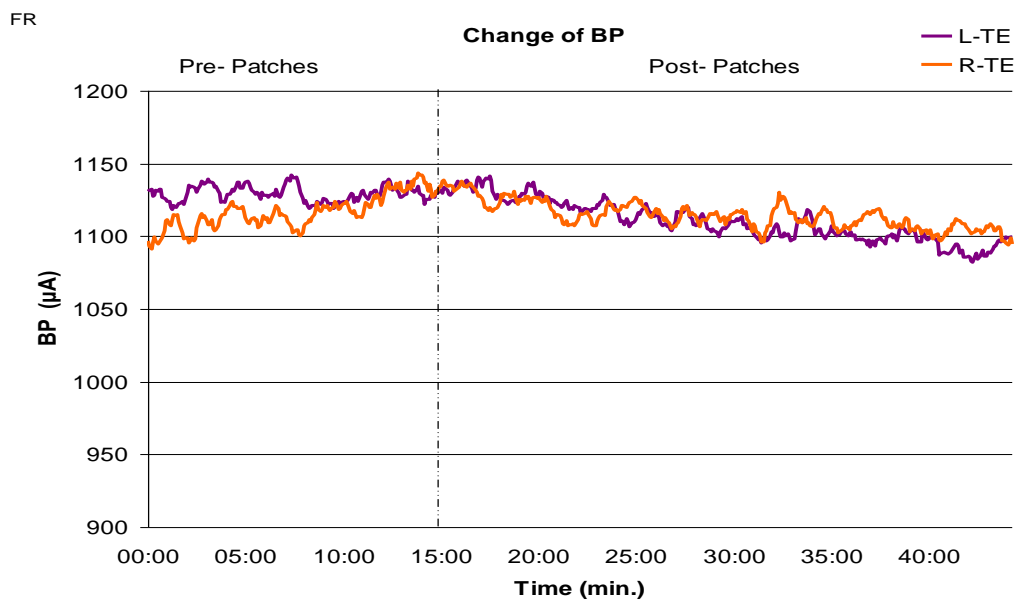


Fig. 14

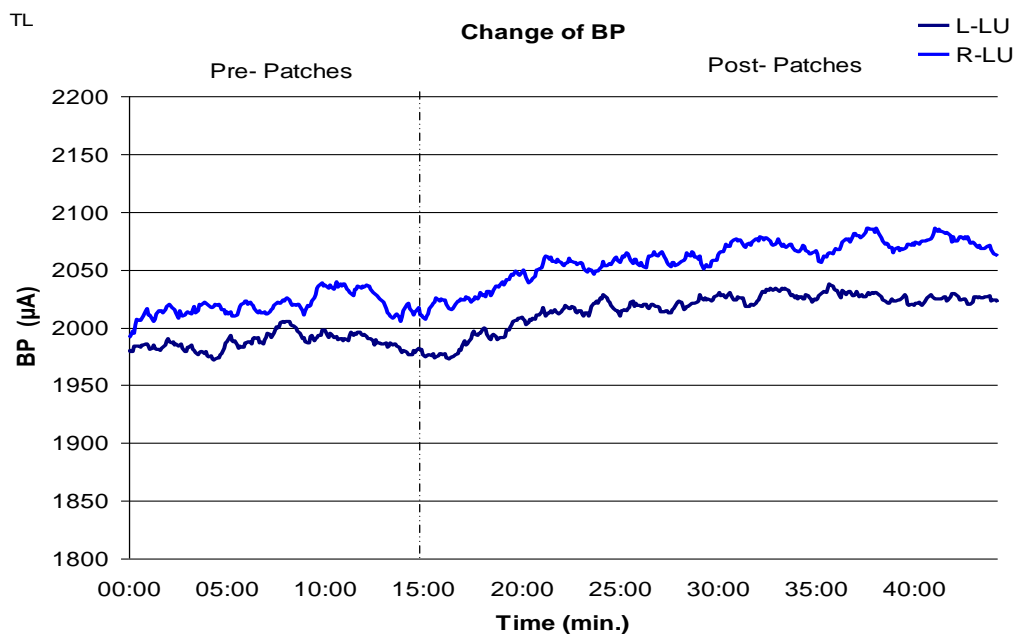


Fig. 15

As shown in Fig. 16, which is an example of a BP graph for the lower body Sei-points, the change in BP values were for a gradual increase while wearing the patches. Such increasing trends in the lower body were seen with six subjects. No outstanding change patterns were observed for three subjects, although some sporadic variations in BP occurred during the entire session. There was only one subject who showed a consistent decrease in BP after putting the patches on. This one exception was subject TT who was on daily medication. From this result it may be said that lower body meridians tend to either increase or remain the same but do not decrease with the patches in subjects of normal health. A Chi-square test with 1 subject with a decrease and 9 subjects with no decrease gave a significant probability ($p=0.0114$). TT distinct behavior, in that BP values showed a steady decrease in both upper and lower body meridians, is most probably related to the fact he alone is on daily medication.

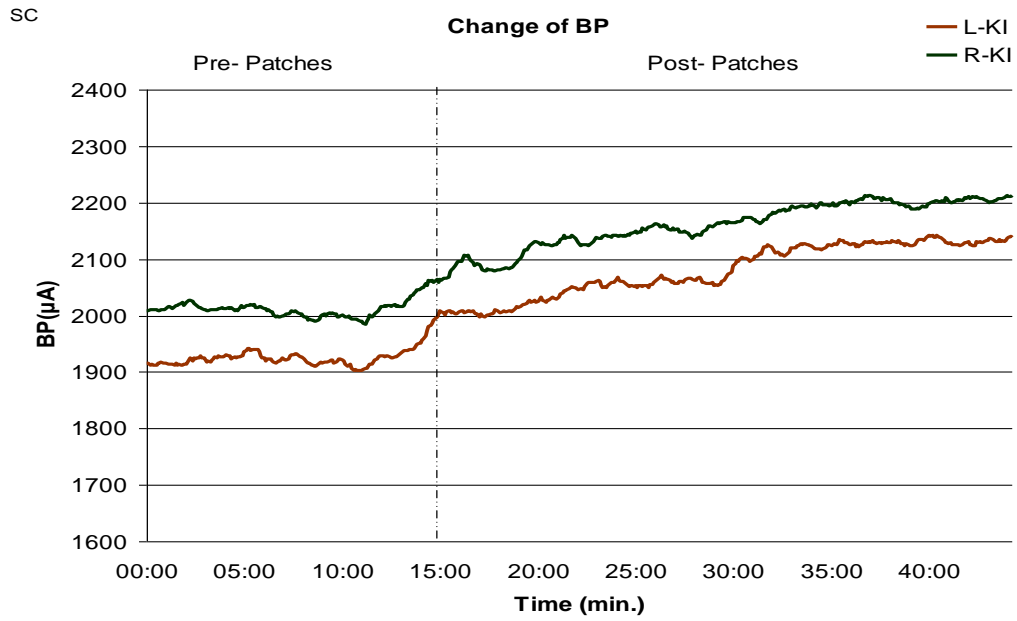


Fig. 16

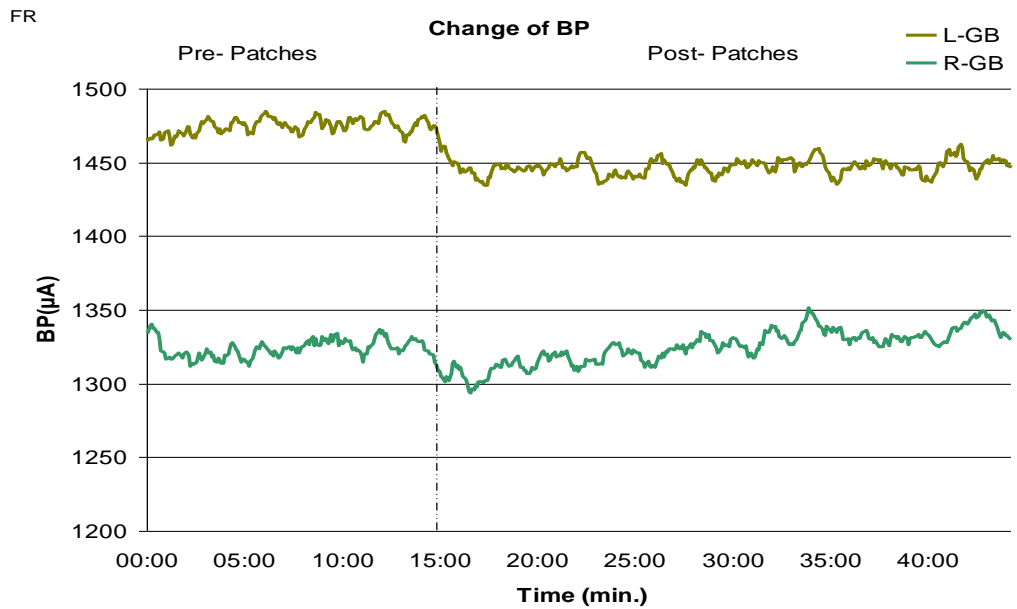


Fig. 17

Next, an attempt was made to statistically evaluate the time-dependent changes in BP, either increase or decrease in both left and right sides of the 14 meridians, by taking 10 min data segments from the “control” and “Experiment 2” nearer to the end of each period. T-tests (two-sample assuming equal variances) were then performed between two data groups for both left and right sides of each meridian as shown below.

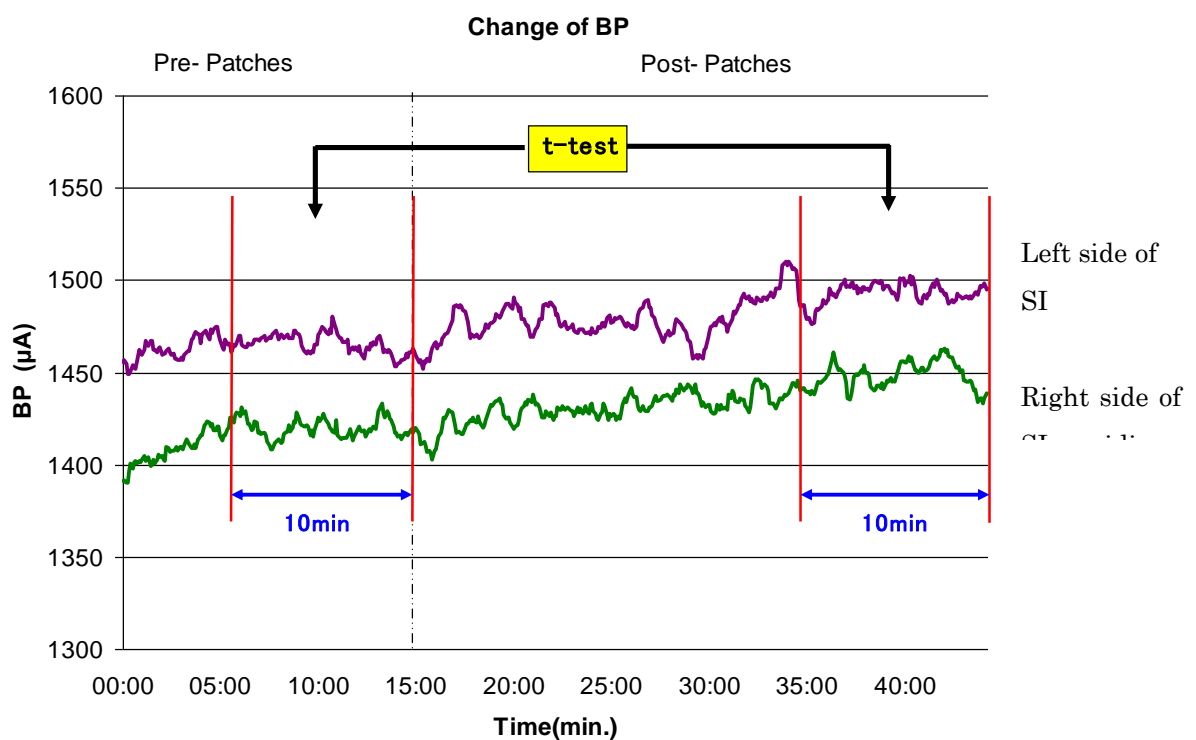


Table 8-10 shows p-values obtained from t-tests for three subjects who showed characteristic patterns. The p-values highlighted in yellow indicate statistically significant decreases, whereas those in blue indicate significant increases. Reddish color means no significant change in BP values between the “control” and “Experiment 2”.

significant decrease
significant increase
no significant

For instance, subject AR's case in Table 8 illustrates that a significant decrease in BP was seen for all meridians of the upper body, whereas in the lower body significant increases were dominant. This tendency for significant decreases in the upper body and significant increases in the lower body appeared for six subjects out of ten, including two exceptional cases, where one showed significant decreases in BP for the left and right sides of all 14 meridians and the other showed significant increases in all meridians.

Upper body							$\alpha(0.05)$
	LU	LI	PC	DI	TE	HT	SI
Left	8.49E-44	3.57E-33	1.82E-37	5.02E-44	2.54E-31	7.86E-39	1.95E-32
Right	1.32E-22	4.82E-14	3.04E-27	1.68E-40	4.36E-37	1.52E-46	3.1E-45
Lower body							$\alpha(0.05)$
	SP	LV	ST	SB	GB	KI	BL
Left	1.08E-24	2.72E-47	1.47E-51	2.14E-39	3.81E-13	1.06E-13	0.207051
Right	3.13E-12	7.54E-08	7.93E-14	4.79E-26	0.023218	4.06E-06	3.12E-14

Table 8: t-tests for AR

Table 9 reveals, in contrast, that significant increases in all BP mean values are conspicuously exhibited in the upper meridians, the lower meridians showing no real trend. Only two subjects showed this type of pattern out of 10 subjects, excluding the two exceptional cases referred to above.

Upper body								$\alpha(0.05)$
	LU	LI	PC	DI	TE	HT	SI	
Left	1.71E-46	3.02E-27	5.89E-43	5.98E-49	3.12E-23	3.24E-32	4.4E-55	
Right	3.21E-61	1.53E-39	3.66E-62	3.16E-61	3.24E-36	1.18E-59	9.45E-48	

Lower body								$\alpha(0.05)$
	SP	LV	ST	SB	GB	KI	BL	
Left	0.000201	0.135612	4.1E-13	0.321056	0.281841	0.426056	2.79E-07	
Right	0.078131	1.31E-05	0.985588	1.9E-06	1.11E-13	0.001879	0.002806	

Table 9: t-tests for TL

Table 10 is an unusual case showing that significant decreases in BP were seen in the upper body, whereas in the lower body significant increase and decrease were mixed. Unlike the cases presented in Tables 8 and 9, the occurrence of significant p-values for decrease or increase does not appear to have any distinct pattern.

Upper body								$\alpha(0.05)$
	LU	LI	PC	DI	TE	HT	SI	
Left	2.07E-16	0.002707	0.283623	0.484211	0.002051	1.61E-19	0.013802	
Right	0.520603	0.730385	0.603513	0.043223	0.024422	0.687389	0.421275	

Lower body								$\alpha(0.05)$
	SP	LV	ST	SB	GB	KI	BL	
Left	2.3E-11	4.95E-15	0.008245	2.46E-08	7.66E-10	0.53313	0.03813	
Right	0.704854	6.8E-16	4.48E-08	2.08E-20	1.21E-19	0.019639	5.75E-05	

Table 10: t-tests for HB

To examine if there is a difference between the upper body and lower body in the patterns of occurrence of significant increases or decreases in BP mean values between the “control” and “Experiment 2” segments as shown above, frequencies of occurrence were counted and results were subjected to a Chi-square test. The result is shown in Table 11. It turns out that there is a very significant difference ($p=4.5 \times 10^{-8} \ll 0.001$) between the meridians in

the upper body and the lower body. This result shows that Ki-energy tended to shift to the lower body after patches were applied on both soles.

	Left & Right		
	significant increase	significant decrease	no significant
Upper	45	86	9
Lower	80	38	22

Df	2
χ^2 value	33.8323
$\chi^2(0.95)$	5.9915
P value	4.502E-08

Table 11: Chi-square test on the frequencies of occurrence of significant increases and decreases.

Furthermore, the p-values obtained from the t-tests above were plotted for all the meridians in logarithmic scale (Fig. 18) to facilitate comparison among the meridians as to how changes occurred after placing the patches. Each dot represents a subject distinguished by a unique color and shape.

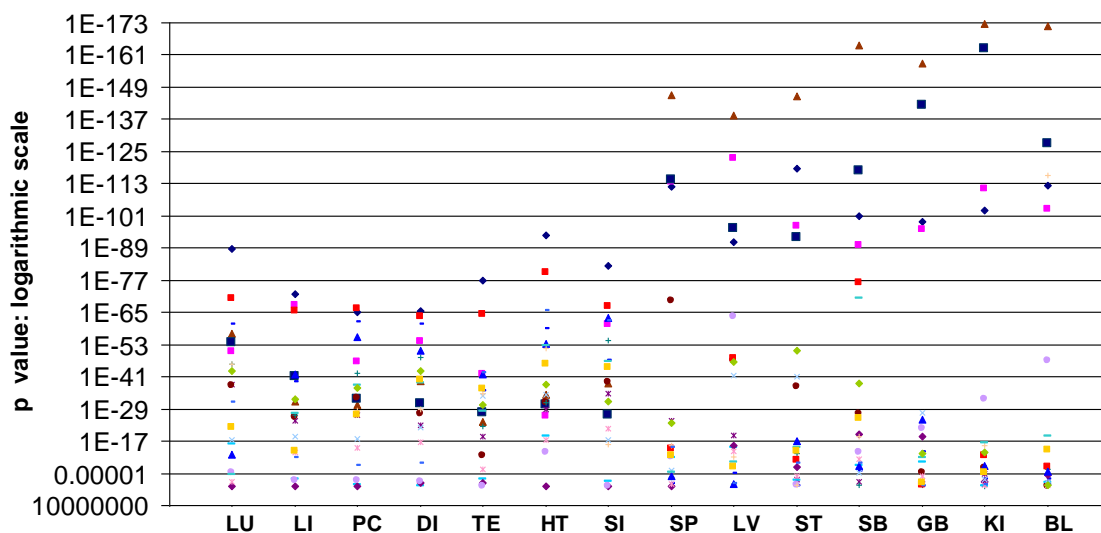


Fig. 18: Logarithmic scale of subjects' p-values obtained from t-tests for each meridian

From Fig. 18 it is apparent that the p-values of the lower body meridians are more widely dispersed compared to those of the upper body meridians. This indicates that the patches on the soles caused Ki-energy levels in meridians in the lower body to change more dramatically than those in the upper body for half of the subjects tested. It is interesting to note that the split in p-value distribution is more pronounced in GB, KI and BL meridians, namely, about 50% of the subjects appear to have responded to the patches in an enhanced manner.

4) Discussion

Looking at overall trends in BP graphs, it was not evident if there was any common pattern of time-dependent change possibly induced by the application of the patches. Despite the fact that the patches were applied on KI 1 points, no unique change in Kidney meridian was observed within the 30 min test period. However, statistical evaluation of 10 min segments closer to the end of the “control” and “Experiment 2” periods and analysis of frequency of occurrences of increases and decreases yielded significant results indicating a tendency for the Ki-energy to shift more to the lower side of the body. This result of continuous AMI tests corroborates the result of upper/lower ratio analysis obtained from snapshot AMI tests. Therefore, these results together strongly indicate that the application of the patches induced an overall shift in Ki-energy toward the lower body, which is most probably related to the fact that the patches were applied to the soles.

4. Polygraph Test

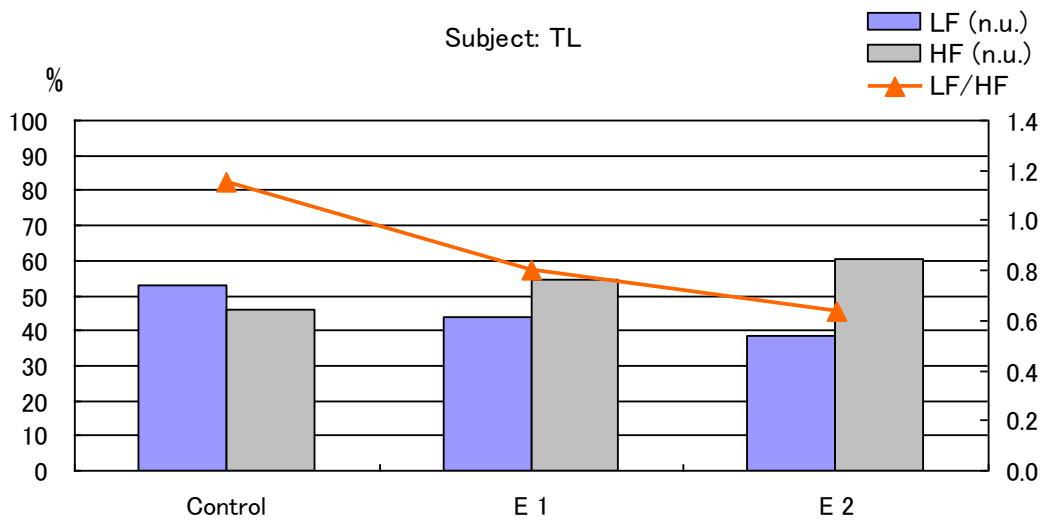
1) Heart Rate Variability (HRV) and Results

Heart rate variability (HRV) has been used as a marker that reflects the effects of the autonomic system on the human cardiovascular system by medical professionals and researchers.⁵ For data acquisition, the Polygraph system (ECG, PPG and respiration) was run in parallel with the continuous AMI as described earlier. In order to investigate how HRV changes as a result of wearing the patches, ECG signals were recorded and analyzed using the BIMUTAS multi bio-signal analyses software (KisseiCom tech Inc.). HRV has two types of analytical methods: one is time domain analysis of R-R intervals and the other is frequency domain analysis. In this study a spectral analysis of the HRV signals generated from ECG recordings was performed by the BIMUTAS software. The analysis of HRV power spectrum was adopted to examine the state of the autonomic nervous system, consisting of sympathetic and parasympathetic nervous activities. Focus was placed on three frequency zones: very low frequency (VLF; 0.0033 – 0.04 Hz), low frequency (LF; 0.04 - 0.15 Hz) and high frequency (HF; 0.15 - 0.40Hz). An earlier study indicates that VLF components tend to diminish when wearing Lifewave patches.⁶ Unlike the results they obtained no significant reduction of the VLF component was recognized in this pilot study with the 10 male subjects, possibly due to difference in positions of the patches, i.e., upper part of the chest vs lower extremities. The LF/HF ratio was therefore adopted as an indicator to gauge the changes in autonomic nervous systems activities in this study.

Although LF/HF ratio changes through the “control”, “Experiment 1” and “Experiment 2”

periods varied from individual to individual, roughly three patterns were noted: 1) a progressive decrease of the ratio, 2) a progressive increase of the ratio and 3) almost no change. The following figures and tables show examples of pattern 1) and pattern 2) cases. The power of LF and HF components were calculated in normalized units (n.u.), which represent the relative value of each power component.

First example, Fig. 19 shows that the LF/HF ratio decreased progressively “with patches”. The ratio declined steadily from Control through Experiment 1 and 2, 1.151, 0.801 and 0.634, respectively. The HF component increased through the session “with patches” and conversely the LF component decreased. This result indicates that the sympathetic nervous activity was taken over by parasympathetic nervous activity presumably due to the effect of the patches. This pattern of LF/HF ratio was observed for 4 subjects.



	LF (n.u.)	HF (n.u.)	LF/HF
Control	53.0	46.0	1.151
E 1	43.7	54.6	0.801
E 2	38.3	60.4	0.634

Fig. 19

The second example (Fig. 20) presents the case where the LF/HF ratio increased progressively from the control to the experiments, 0.543, 1.254 and 4.258, respectively. The LF component increased consistently, while the HF component decreased through the test session. This change in LF and HF components suggests that the activity of the autonomic nervous system shifted from parasympathetic to sympathetic dominance presumably due to wearing the patches. This pattern of LF/HF ratio change was seen in five subjects.



	LF (n.u.)	HF (n.u.)	LF/HF
Control	34.7	63.9	0.543
E 1	55.2	44.0	1.254
E 2	80.6	18.9	4.258

Fig. 20

2) Respiration and Results

Respiration is affected by our physical and psychological functioning. Monitoring the respiratory state was expected to show some influence of the patches on the body condition. In order to detect changes in respiration, a thermistor airflow sensor was mounted adjacent to the nostrils of the subjects. The two tips of the pins from the sensor were aligned with the nostrils to optimally detect the temperature of the air flowing in and out of the nostrils. Respiratory movements were monitored on the computer screen through the BIMUTAS recording system. FFT analysis was performed on the data obtained from the signals to identify features in the power spectrum which could provide supplementary information regarding autonomic nervous activities.

Table 12 represents the result of FFT analyses in three events such as before the patches (control in 15 min), during the patches (Experiment 1 in the first 15 min and Experiment 2 in the second 15min). The most dominant frequencies were identified from calculated FFT spectra for each event and summarized in Table 12 below. Nine subjects out of ten showed a lower frequency in Experiment 2 compared to that of Control, even though the frequency in Experiment 1 increased temporarily for some subjects. One exception was subject TT who is on daily medication. Chi-square test for this seeming anomaly to occur by chance was significant with $p=0.0114$. Thus, excluding this anomaly, it can be said that breathing frequency decreases after applying the patches for subjects of normal health.

		Unit: Hz					Unit: Hz		
		Control	Experiment 1	Experiment 2			Control	Experiment 1	Experiment 2
AR		0.293	0.244	0.244	MF		0.122	0.11	0.11
EP		0.293	0.244	0.269	SC		0.244	0.269	0.183
FR		0.122	0.098	0.11	TL		0.208	0.22	0.195
HB		0.195	0.146	0.098	TT		0.146	0.244	0.269
MS		0.293	0.269	0.269	WG		0.22	0.146	0.122

Table 12: Summary of Respiration Frequencies

3) Combination of HRV & Respiration and Results

The following figures show the change in the state of the autonomic nervous system by plotting both the dominant frequency of respiration and LF/HF ratio through the 3 events of the test session. The left vertical axis represents the frequency of respiration in Hz, while the right vertical axis represents the LF/HF ratio. By visual observation of the graphs of all the subjects they were classified into three patterns as shown below.

As shown in Fig. 21, the first pattern is the one in which both the frequency of respiration and the LF/HF ratio tended to decline through the experiment. This pattern may be interpreted as that by wearing the patches the parasympathetic nervous system became more dominant. Five subjects out of ten showed this pattern.

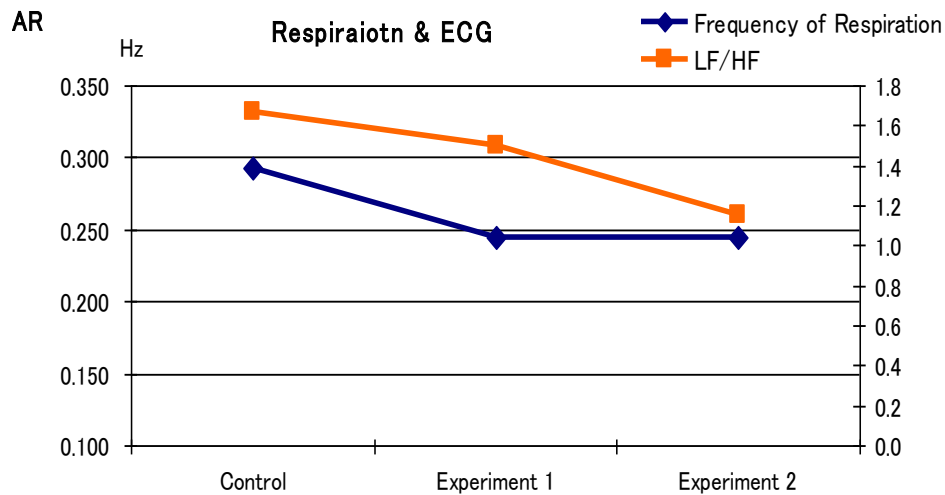


Fig. 21

The second pattern, shown in Fig. 22, is the one in which the two parameters both increased through the experiment together. This indicates that sympathetic nervous system activity was enhanced possibly by wearing the patches. This pattern was seen only with one subject TT, who is on daily medication as shown in Table 1 and hence is probably an anomalous case.

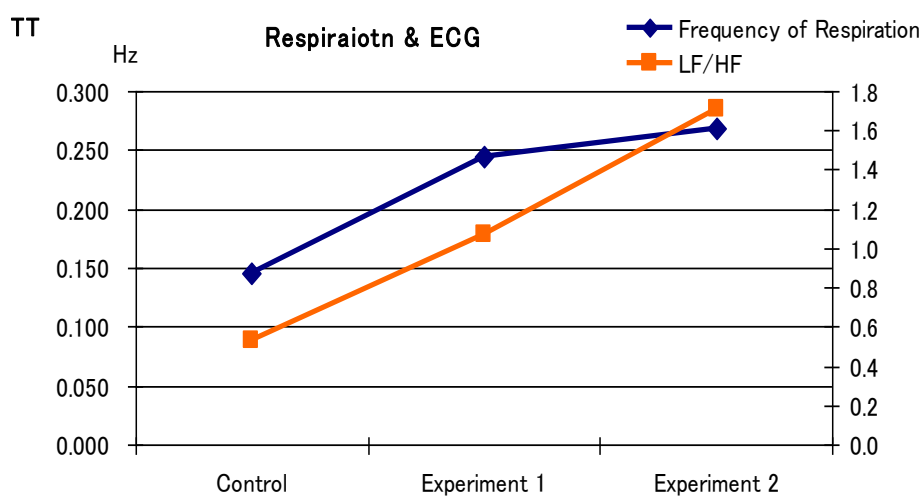


Fig. 22

In the third pattern, the frequency of respiration and the LF/HF ratio intersect each other as shown in Fig. 23. The frequency of respiration decreased progressively while the LF/HF ratio increased progressively, a diametrically opposite behavior. In the case of this particular subject the sympathetic nervous system was dominant ($LF/HF > 3.5$) in the control period and it became even more dominant after the patches. Contrary to this, the frequency of respiration came down from 0.195Hz to 0.098Hz. This low frequency of respiration in “Experiment 2” implies that the subject was in predominantly parasympathetic state. It may be that the low respiratory frequency (~ 0.1 Hz) caused the ECG to be modulated thereby seemingly increasing the LF component in the HRV spectrum. Patterns similar to

this case were seen with 4 subjects.

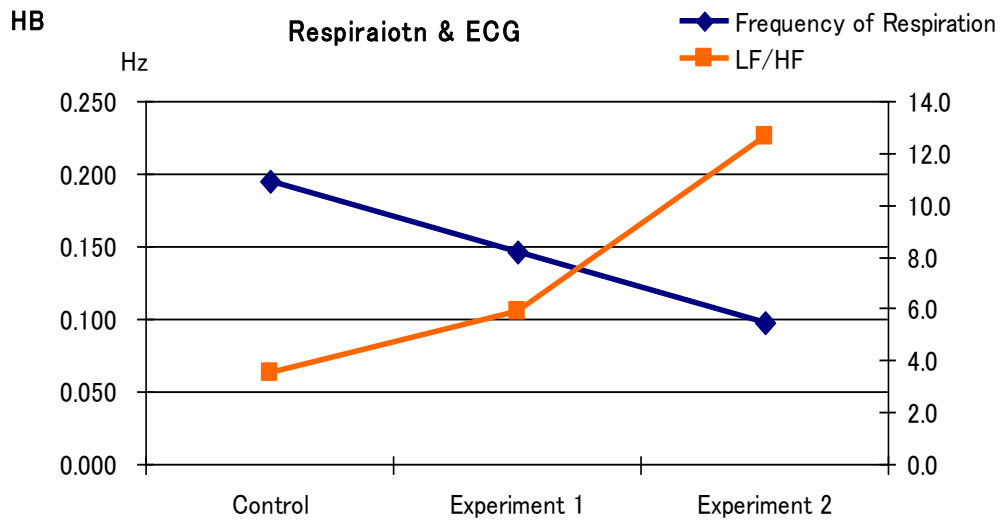


Fig. 23

4) Discussion

As described above, there were essentially three patterns in the change of indicators for the circulatory and respiratory systems. A decrease in both the frequency of respiration and the LF/HF ratio clearly indicates prevalence of the parasympathetic system, which was found in 5 cases out of ten. Only one case showed an increase in both indicators suggesting heightened activity of the sympathetic nervous system. In the remaining 4 cases, the respiratory frequency decreased progressively but the LF/HF ratio trended upward. However, the significant decrease in the frequency of respiration is a strong indicator of parasympathetic system dominance. Therefore, it may be said that out of the 10 subjects 9 showed shift toward the parasympathetic dominance after applying the patches. In view of the fact that TT is distinct from the rest of the subjects this result implies that the patches

tend to induce a parasympathetic state in all subjects of normal health.

III. Conclusion and Recommendation for Further Study

Statistically significant results were obtained strongly indicating that the Energy Enhancer Patches do generate measurable changes in both biophoton emission intensities and the body's energetic condition. With generally healthy subjects the changes induced appear to be in the desirable direction (i.e. improvement in body functions and a more relaxed state). Unexpectedly, there was one subject who happened to be on daily medication for high blood pressure and cardiovascular problems. This particular subject should have been disqualified from this study which was planned for a group of healthy male subjects.

However, it is worth mentioning that the results obtained with this "unhealthy" subject are very distinctly different from all others and may offer important implication. He is the only one who registered an "increase" in biophoton emission. He is the only one who showed a decrease of Ki-energy for all meridians both in the upper body and lower body. He is the only one whose autonomic nervous system indicators distinctly shifted toward a sympathetic state.

Although unintended, this observation may suggest that generally healthy persons and unhealthy persons could respond to the Energy Enhancer Patches very differently. With the unhealthy person, the overall shift may not necessarily be in the desirable direction. Although this is only a highly speculative thought based on a single observation, it appears to deserve more extensive study in a different context.

The results of this pilot study imply that the effect of the Energy Enhancer Patches would probably vary depending on where they are applied. Repeating similar tests by applying the patches at acupuncture points on the upper body may give further insights into how the patches act on body's energy systems.

Based on the results and implications derived from this pilot study, which are necessarily only indicative in nature due to the small number of subjects tested and also not having control subjects, it is suggested that more extensive study be conducted with a larger number of subjects basically with the same set of testing instruments for Biophoton Emission, AMI Parameters, ECG, Respiration, etc but with a modified protocol (especially for the Continuous AMI test) to include controls.

An outline of a larger study could be as follows:-

- 1) Test Subjects: 35 persons (all healthy males in broader age range) – screening to be performed more rigorously to exclude “anomalies”.
- 2) Test against Placebo: Perform double blind tests with Genuine Patches and Placebo Patches, allowing a 3-day interval minimum between two tests, a control test and a Genuine Patches test, on each individual subject. This will produce 35 pairs of Genuine vs Placebo test results, which should enable more definitive conclusions to be drawn regarding the effects of the Energy Enhancer Patches.
- 3) Longer Test Period with Continuous AMI: Results of the present pilot study suggests that longer time is necessary for the AMI parameters to stabilize under effects of the patches. Therefore, a new design of the Continuous AMI test protocol to monitor a longer period

after applying the patches, from the present 30 min to 45 min is one possibility.

- 4) Change the position of the Patches (if feasible): The present pilot study strongly implies that the changes induced by the patches are likely to differ depending on their position. It may be advisable, for example, to use a selected pair of associate points on the back which, when stimulated, is known to have profound effects on both meridian and autonomic nervous system functions.

References:

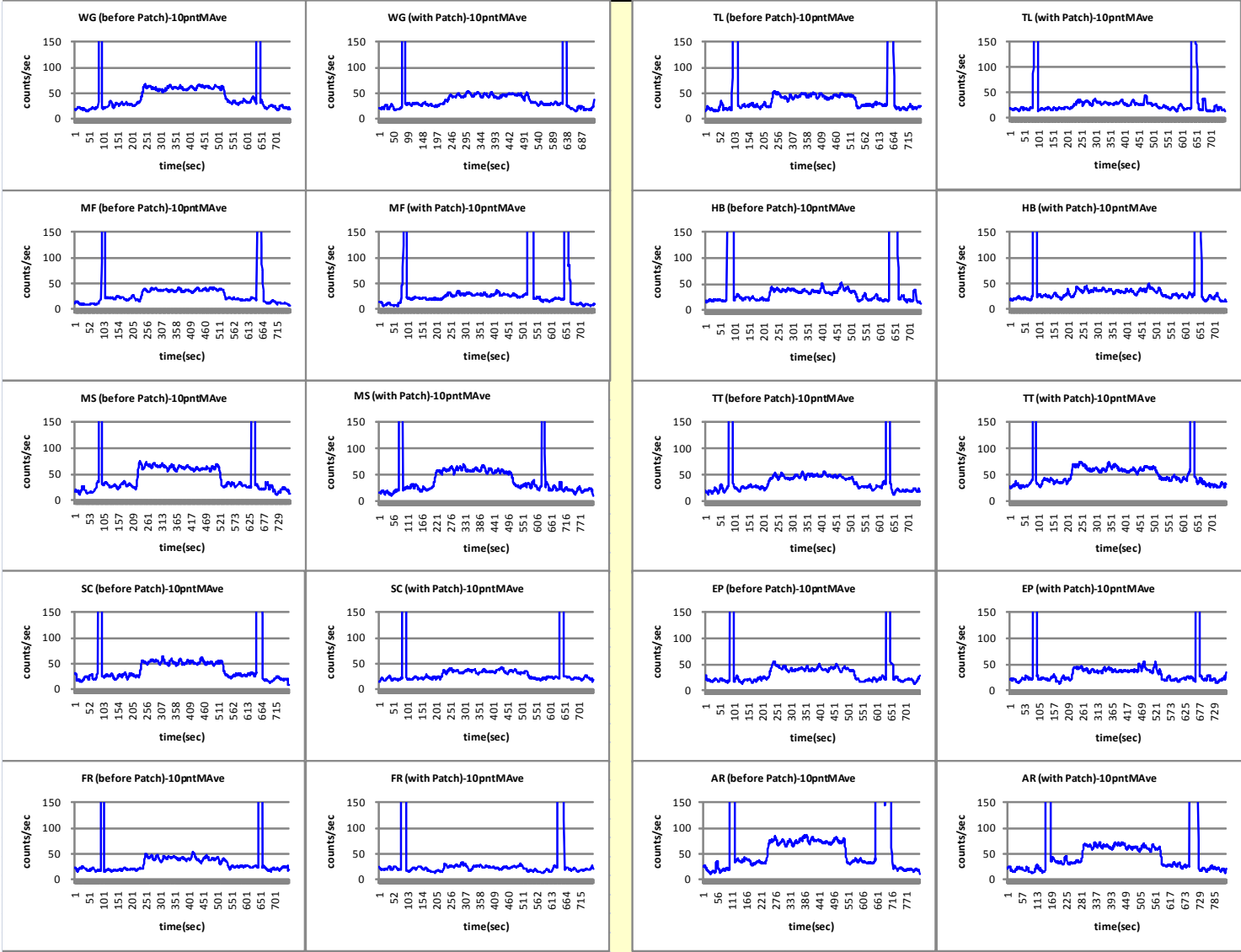
- 1) "Biophotons", S. Cohen and F.A. Popp, edited by J.J. Chang, J.Fish and F.A. Popp (Kluwer Academic Publisher, Bordrecht-Boston-London, 1998.
- 2)"Nonlocal effects of biophoton emission from the human body", Sophie Cohen, Fritz-Albert Popp and Yu Yan, International Institute of Biophysics, 2003
- 3) "Ultraweak photon emission of human skin in vivo: Influence of topically applied antioxidants on human skin", Sauerman G, Mei WP, Hoppe U, Stab F; Meth Enzymol 1999;300:419-428
- 4)"About the Coherence of Biophotons (1)~(5), Fritz-Albert Popp, International Institute of Biophysics, 1999
- 5) "Heart Rate Variability, Standards of measurement, physiological interpretation, and clinical use, Malik et al. European Heart Journal (1996) 17, 354-381
- 6) "Heart Rate Variability Enhancement Through Nanotechnology: A Double-Blind Randomized-Control Pilot Study", T.H. Budzynski, H.K. Budzynski, K. Maret, Hsin-Yi(Jean) Tang, Journal of Neurotherapy, Vol. 12(1) 2008

APPENDICES

- 1. Biophoton Test Graphs (smoothed by 10-point moving average) of “before patches” and “with patches”**
- 2. Biophoton Test Graphs (raw data) of “before patches” and “with patches”**
- 3. Heart Rate Variability (LF, HF, LF/HF ratio)**
- 4. Summary of p-values of t-tests for individual meridians between Control & Experiment 2 of all subjects (Continuous AMI)**
- 5. Changes of Respiration Frequency & LF/HF ratio of all subjects**

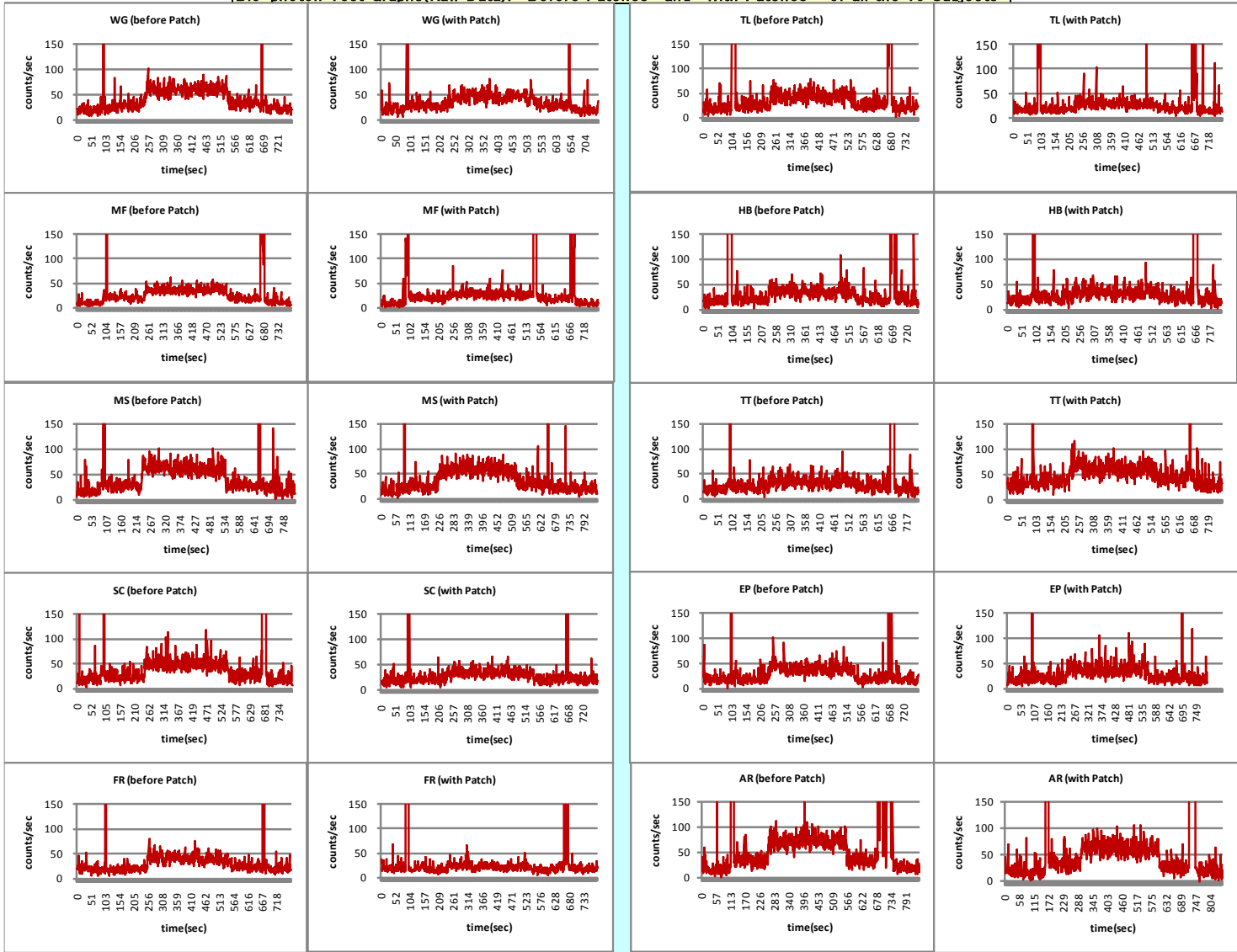
APPENDIX 1: Biophoton Test Graphs (smoothed by a 10-point moving average) of “before patches” and “with patches”

Bio-photon Test Graphs(10 points Moving Average): “Before Patches” and “With Patches” of all the 10 Subjects

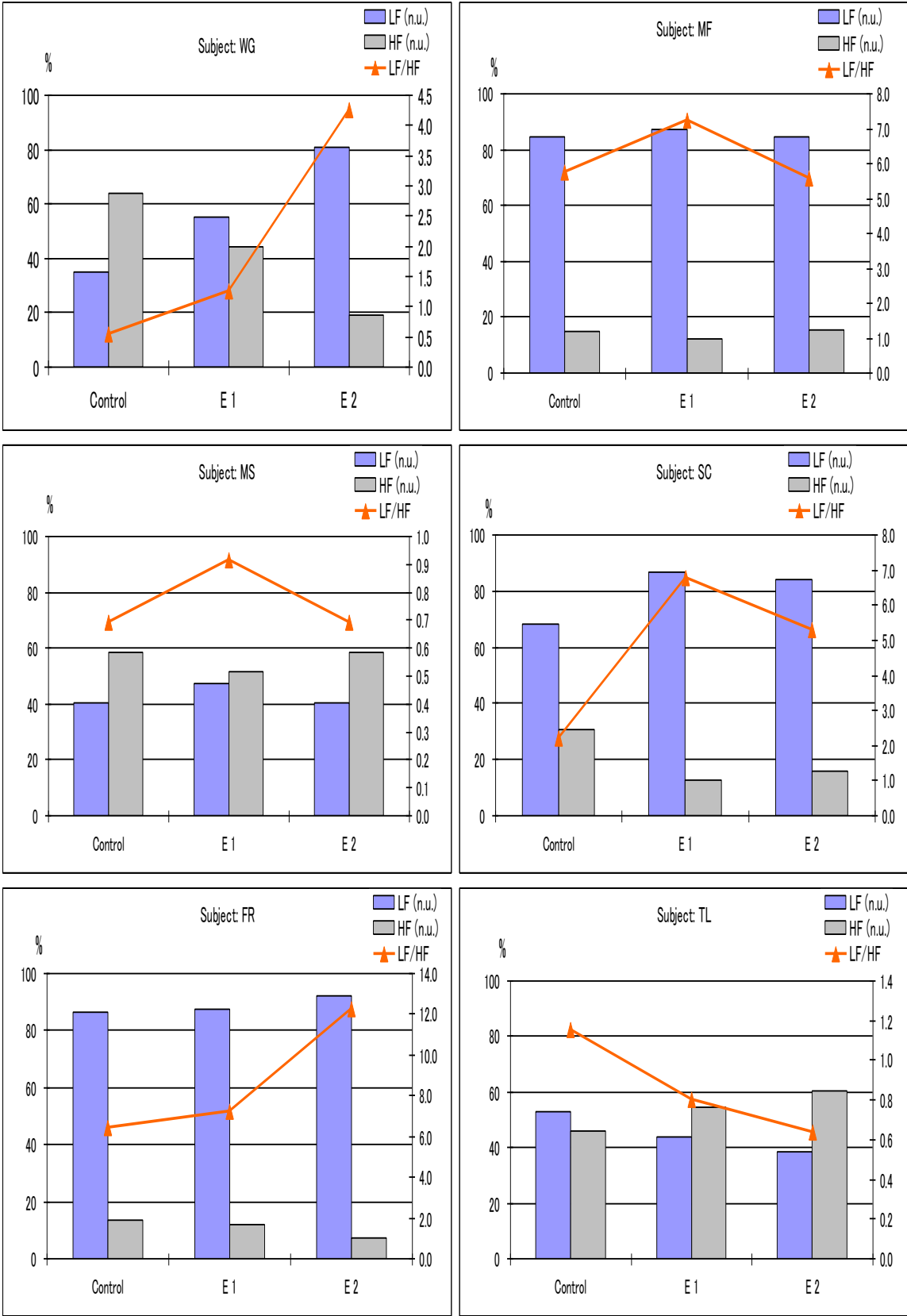


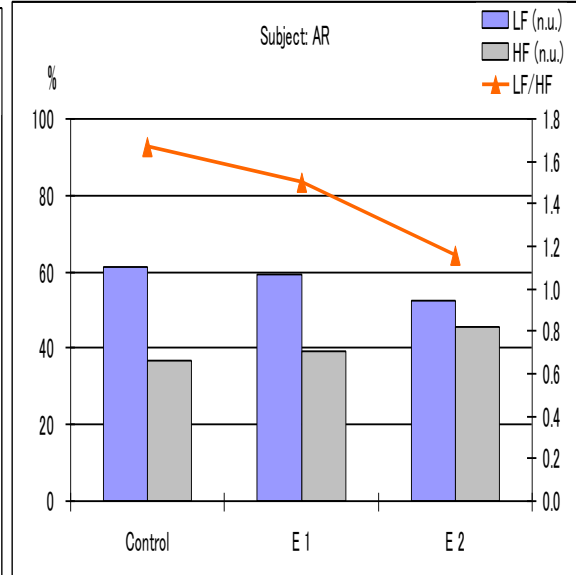
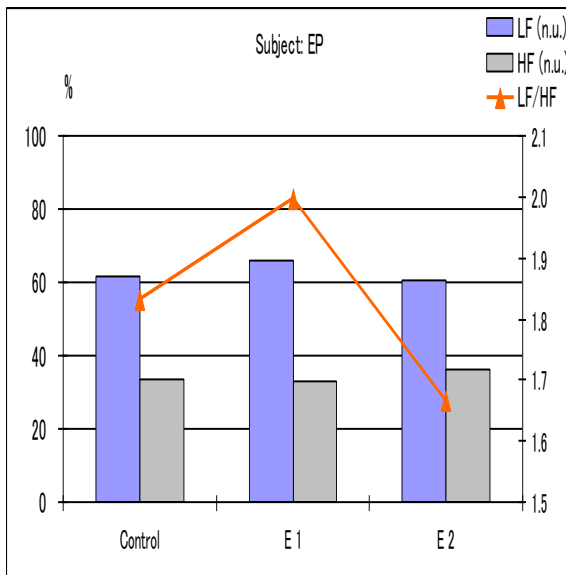
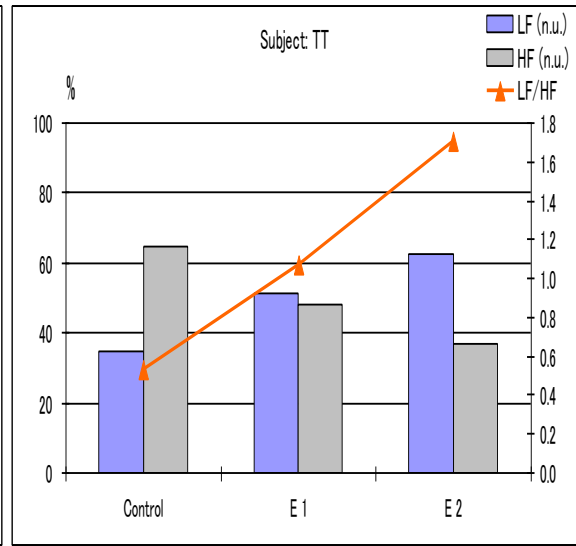
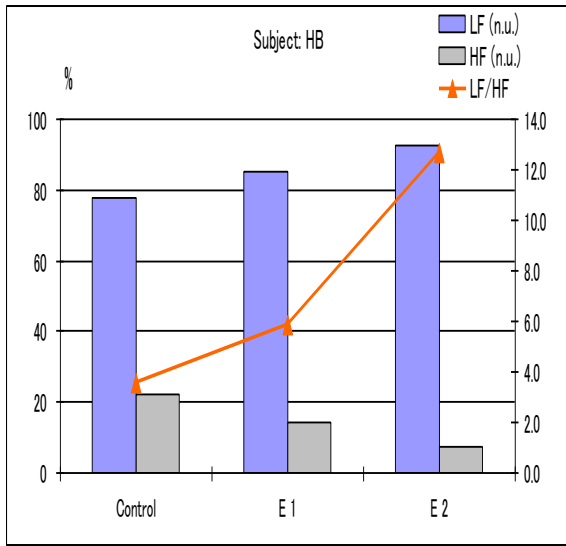
APPENDIX 2: Biophoton Test Graphs (Raw Data) of “before patches” and “with patches”

Bio-photon Test Graphs(Raw Data): “Before Patches” and “With Patches” of all the 10 Subjects



APPENDIX 3: Heart Rate Variability (LF, HF, LF/HF)





**APPENDIX 4: t-test p-values of individual meridians between
Control & Experiment 2 periods for all subjects (Continuous AMI)**

significant increase
 significant decrease
 no significant change

WG Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	8.9902E-39	2.0398E-25	1.2501E-27	1.7242E-23	1.4279E-19	1.4685E-29	1.4745E-35
Right	1.356E-38	1.4941E-26	1.2335E-33	4.7757E-28	2.2379E-12	5.6765E-32	8.3613E-40

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	2.4701E-25	1.0684E-19	0.00276782	0.00892815	0.13468409	1.2524E-05	0.03358253
Right	5.3783E-70	7.6321E-48	4.3892E-38	6.5604E-28	4.1923E-06	1.8592E-07	0.67072639

MF Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	7.38E-71	1.9268E-66	4.0458E-67	5.5739E-64	6.0419E-65	1.2963E-80	4.3846E-68
Right	1.1741E-12	8.2468E-43	1.9828E-56	1.7898E-51	1.2222E-42	7.3072E-54	6.7333E-64

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	9.2217E-15	1.5775E-48	1.1719E-10	1.0192E-76	0.27769399	3.3555E-12	2.8822E-08
Right	0.00013171	0.08303935	1.227E-17	1.3414E-08	1.0736E-25	1.896E-08	3.3427E-06

MS Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	4.2481E-32	2.0514E-11	1.4589E-08	2.9479E-09	3.6341E-43	2.6241E-66	1.6907E-62
Right	2.5774E-05	6.7511E-28	2.1897E-38	3.5555E-39	1.12E-28	4.9047E-53	4.5994E-47

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	3.8128E-15	0.06229069	1.6022E-09	1.6022E-09	0.64335964	0.1981751	0.17660861
Right	4.5648E-06	6.0899E-10	3.0703E-15	4.5274E-71	2.4801E-11	4.529E-17	2.8359E-19

SC Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	1.3285E-57	1.9791E-32	1.9289E-31	5.7372E-40	7.2585E-25	3.6957E-35	2.0285E-39
Right	1.505E-54	1.3046E-41	2.2466E-33	1.2493E-31	3.4662E-28	3.3879E-31	1.6728E-27

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	1.21E-146	2.548E-139	3.592E-146	1.785E-165	1.119E-158	1.84E-173	2.291E-172
Right	6.011E-115	5.2807E-97	1.767E-93	2.242E-118	5.939E-143	3.656E-164	1.172E-128

FR Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	2.7765E-18	1.5937E-19	1.2884E-18	8.9063E-23	1.6557E-34	6.4193E-35	4.6856E-18
Right	0.01193302	1.583E-13	2.9248E-15	3.2038E-17	3.3477E-07	3.7941E-18	3.3295E-22

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	5.3968E-07	3.3766E-42	1.002E-41	6.3224E-06	2.6512E-28	0.00125045	0.04632199
Right	0.09263411	7.5662E-14	8.5658E-05	4.5554E-11	0.00014626	0.16201716	0.3092956

TL Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	1.7073E-46	3.0206E-27	5.8884E-43	5.9806E-49	3.1172E-23	3.2397E-32	4.3997E-55
Right	3.2144E-61	1.5282E-39	3.6572E-62	3.1623E-61	3.2404E-36	1.1836E-59	9.4487E-48

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	0.00020109	0.13561231	4.1003E-13	0.32105552	0.28184131	0.42605634	2.7932E-07
Right	0.07813073	1.3109E-05	0.98558768	1.9025E-06	1.1142E-13	0.00187933	0.00280584

HB Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	2.0664E-16	0.00270698	0.28362292	0.48421106	0.00205117	1.6141E-19	0.01380193
Right	0.52060264	0.73038496	0.60351265	0.04322318	0.02442166	0.68738877	0.4212754

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	2.2957E-11	4.9462E-15	0.00824543	2.458E-08	7.661E-10	0.5331296	0.03813021
Right	0.70485442	6.7959E-16	4.4805E-08	2.0818E-20	1.2124E-19	0.01963925	5.7518E-05

TT Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	2.103E-89	1.698E-72	1.0852E-65	3.4554E-66	8.5163E-78	1.1364E-94	2.9996E-83
Right	6.8491E-51	3.8363E-68	3.6388E-47	9.655E-55	1.1677E-42	3.4758E-27	2.7969E-61

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	9.557E-113	4.3165E-92	3.312E-119	1.55E-101	2.463E-99	1.308E-103	4.759E-113
Right	3.756E-114	4.823E-123	5.0578E-98	1.7689E-90	1.4401E-96	1.303E-111	5.018E-104

EP Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	7.272E-06	0.00607622	0.00772797	0.0211053	0.67083094	2.4925E-13	0.45947028
Right	1.5344E-46	1.3177E-33	4.2999E-29	1.0664E-29	1.4915E-35	2.6304E-52	1.1251E-16

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	7.7424E-12	3.5419E-64	0.38215569	1.9756E-13	1.5035E-22	3.2839E-33	1.4201E-47
Right	3.4187E-16	1.1764E-11	0.29140987	2.5711E-19	0.02932179	4.2155E-16	5.227E-117

AR Upper body α (0.05)

	LU	LI	PC	DI	TE	HT	SI
Left	8.4943E-44	3.5747E-33	1.8182E-37	5.0211E-44	2.5426E-31	7.8628E-39	1.9491E-32
Right	1.3188E-22	4.8157E-14	3.0379E-27	1.6849E-40	4.3632E-37	1.5178E-46	3.098E-45

Lower body

	SP	LV	ST	SB	GB	KI	BL
Left	1.0773E-24	2.7207E-47	1.4704E-51	2.1426E-39	3.8105E-13	1.0577E-13	0.20705145
Right	3.1343E-12	7.5417E-08	7.9336E-14	4.7855E-26	0.02321801	4.0614E-06	3.1197E-14

APPENDIX 5: Changes in Respiration Frequency & LF/HF ratio for all subjects

