

Discussion on Standard Evaluation Method of Non-contact Healing Using Biophotons -Normality of J value and Comparing Non-contact Healing with Thermal/Lighting Conditions-

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Abstract: When a subject does non-contact healing, such as laying-on-of-hands, for sample pieces of cucumber "Shiro-ibo kyuuri", the intensity of biophotons from samples increases. To reconfirm the reliability of our measuring method for this phenomenon, we discussed the method from 3 view points: 1) validity of J value as an index of effects (J value is defined as the logarithm of the ratio of intensities of biophotons between experimental and control samples; 2) system biases; and 3) effects of heat or shadow (i.e. screening of light) of the hands. We re-analyzed previous data of laying-on-of-hands experiments and compared them with additional data. We concluded that the J value had sufficient validity as an index because its distribution was a normal distribution. Variation of intensities of biophotons of samples, differences of speed of drying or the rate of condensing of photons, drifts of temperature and background noise, effects of delayed luminescence, and difference of sensitivities of the measuring system were not considered to have any serious influence on the results. We found that in only the healing condition was the intensity of biophotons of experimental samples significantly larger than the intensity of controls (Wilcoxon signed-rank test, $p = 6.5 \times 10^{-7}$) and there was no significant difference in heat/shadow conditions. J value was 0.142 in the healing condition, but J values were nearly zero in the other conditions (ANOVA, $p = 0.03$). We reconfirmed that healing effects are not the results of heat and shadow of the hands.

Keywords: spiritual healing, biophotons, *Cucumis sativus L.*, laying-on-of-hands, heat, screening of light

1. Introduction

We have developed a quantitative evaluation method for non-contact healing, such as laying-on-of-hands or external qi therapy, using biophotons from plants¹⁻²⁾. In our method, the healers do spiritual healing only for 15-30 minutes to sample pieces of cucumber "Shiro-ibo kyuuri", and then, biophotons from those samples are measured with controls for 18 h. The method is very simple and easy.

To reconfirm the reliability of our method, we discussed the method from 3 view points:

- 1) validity of J value as an index of effects (J value is defined as the logarithm of the ratio of intensities of biophotons between experimental and control samples;

- 2) system biases; and
- 3) effects of heat or shadow (screening of light) of the hands.

In the present data review, we compared data of healing and other conditions with some new data. The method was the same as previously used¹⁻²⁾.

2. Normality of J value

J value is defined as the logarithm of the ratio of intensities of biophotons between experimental samples (I_E) and controls (I_C) [Counts/10000pixels].

$$J = \ln(I_E / I_C)$$

Fig. 1 shows normal probability of J values of actual healing data ($n = 106$ pairs of cucumber samples; measured for 10 male healers and 4 female healers) of previous studies¹⁻²⁾. If the distribution of J values is a normal distribution, data will form a line with a gradient of 45 degrees. **Fig. 2** shows a histogram of actual healing data and a theoretical normal distribution. **Figs. 1 & 2** confirm that J values

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have a normal distribution. This is because the distribution of intensities of samples is nearly equal to a logarithmic normal distribution.

Fig. 3 shows normal probability of logarithm of intensity of experimental samples. There are some differences between theoretical and measured data in **Fig. 3**. The reasons are possibly that cucumbers have been already selected before shipping to the market, and that data are not independent partially because 4 samples were cut from one cucumber, not 4 cucumbers.

Fig. 4 shows normal probability of the differences of intensities of biophotons between experimental and control samples. The curve is nearly a straight line around the center. However, both tails of the distribution differ from a normal distribution. This means that we should use non-parametric tests when sample population and variation are large although we can use a t-test as an approximation when sample population and variation are small.

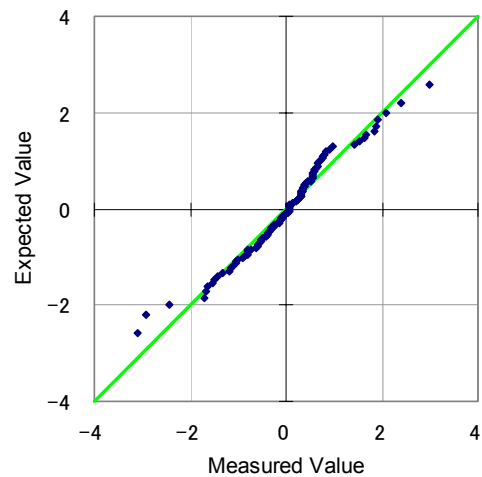


Fig. 3 Normal Probability of Logarithm of Intensity of Experimental Samples

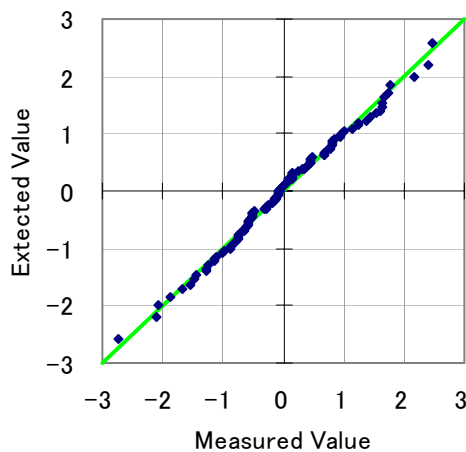


Fig. 1 Normal Probability of J values
(Healing, n = 106 pairs of cucumber samples)

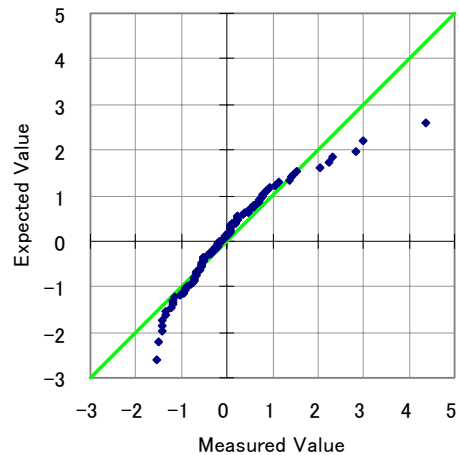


Fig. 4 Normal Probability of Difference of Intensities Between Experiments and Controls

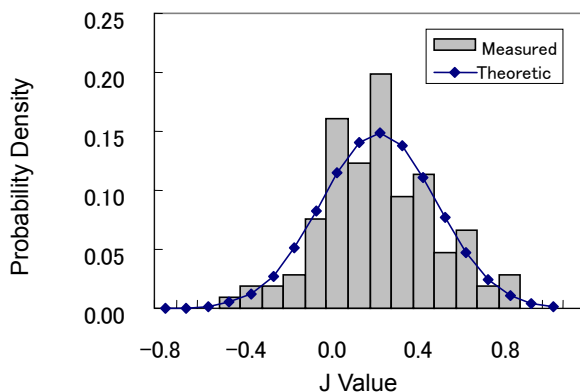


Fig. 2 Measured and Theoretical J Values

3. System Biases

There are 7 possible system biases in our method: 1) variation of intensities of biophotons from samples; 2) difference of the rate of photon condensing because of differences of angles and distances between samples and lens of the image intensifier (I.I.); 3) drift of intensity which is caused by drift of temperature during measurements; 4) drift of back ground noise; 5) variation of speed of drying process of samples; 6) slight differences of sensitivity of I.I.; and 7) delayed luminescence caused by room lighting.

Theoretically, 1)-4) can be cancelled if we use the

following ways of making and arranging samples. We cut 4 sample pairs from one cucumber, not 4 cucumbers because the variation of intensity of biophotons of samples is possibly small. First, a circular slice (thickness: 2 cm) was cut from a cucumber that had been placed on aluminum foil. Then, the slice was cut into two equal-sized disc samples. The flower side part of the paired disc samples was the control and the other was the experiment (Fig. 5). Because the pairs were obtained right next to each other, we considered the difference of intensities of biophoton between experimental and control samples as the smallest. Of course, there is a possibility that some difference occurs because the growing directions of samples are not same. However, such bias can be canceled easily by a calibration which is described later.

Four pairs of samples were made from one cucumber. Controls and experimental samples were placed symmetrically in two glass Petri dishes in the order A to D. Therefore, the distances and angles between the image intensifier lens and the samples are the same in a pair. In addition, drifts of temperature and background noise can be cancelled by the simultaneous measurement for experimental and control samples.

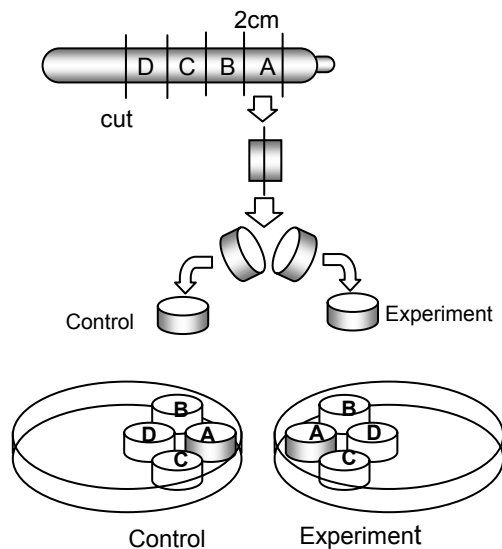


Fig. 5 Making and Arranging Sample Pairs

Item 5), the variation of speed of drying process of samples, can be cancelled by using a moisturizer in a dark box. Typical Japanese deodorants for the refrigerator have a water gel of powdered activated carbon, not only granular activated carbon. We used the moisturizer to maintain humidity in the dark box during measurements.

An example of transition with time of humidity in the dark box is shown in Fig. 6. Humidity decreases by opening/closing the door of the box, and increases gradually. Average humidity is more than 80% for 18 h of measurements.

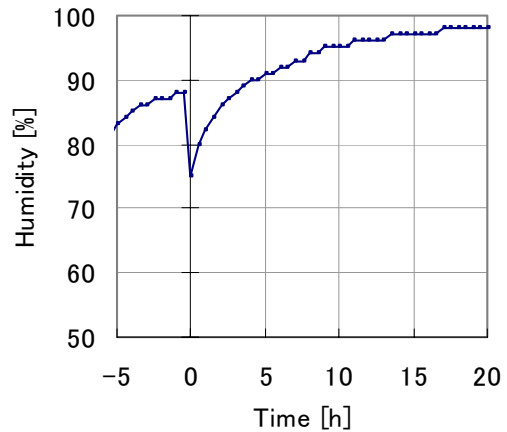


Fig. 6 Transition of Humidity with Time When Using a Moisturizer in a Dark Box Measured every 30min. The dark box was opened and closed at time 0.

Fig. 7 shows transitions of average intensities of biophotons at all sample positions. Each curve was calculated with 102 healing data, 4 data were excluded from when the measuring system was re-started because of power failure. The transitions are the same. It is considered that the effect of sample positions is within the tolerance level.

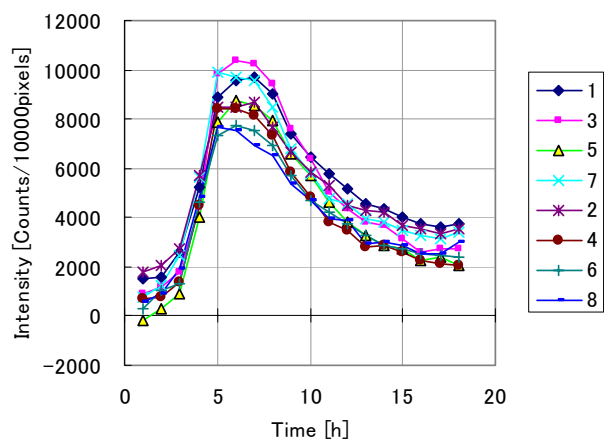


Fig. 7 Transitions of Intensities of All Sample Positions
1,3,5,7: B, A, D, C of Experiment in Fig. 5
2,4,6,8: B, A, D, C of Control in Fig. 5

Additionally, Fig. 8 shows averaged transitions of intensities of experiments and controls of healing data. Fig. 9 shows difference between intensities. There was no difference between experiments and controls at the first 4 h (Phase I), while the difference occurred later. It means that the difference is not caused by variance of speed of drying process. Non-contact healing is considered to influence bio-chemical systems which emit photons at Phase II.

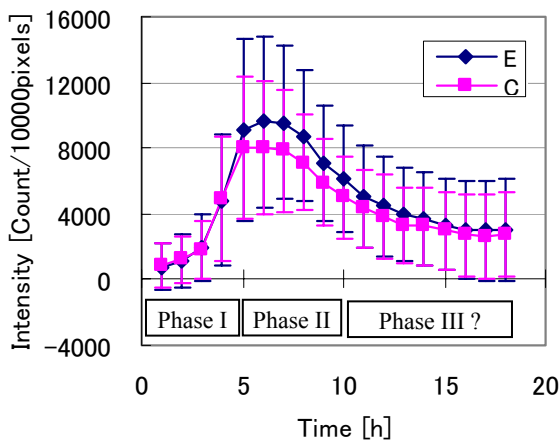


Fig. 8 Experiment and Control of Healing Data
Error bars are standard deviations.

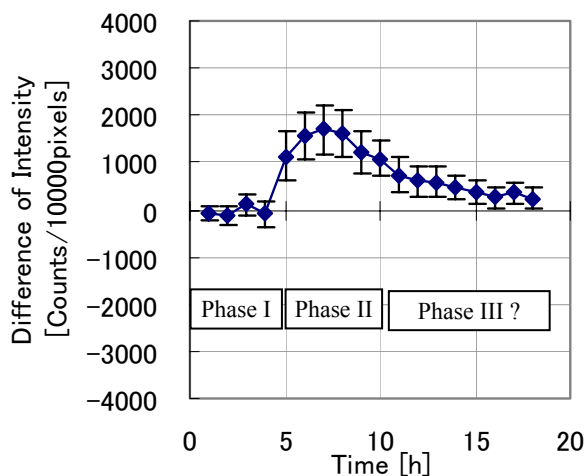


Fig. 9 Difference of Intensity with 95% Confidential Intervals (n=102)

Finally, item 6), difference of sensitivity of the measuring system, can be cancelled if we always use our method of making and arranging samples.

Next, we describe the processing for data after calibration of background noise. First, we make areas for experimental samples as E and control samples as

C (Fig. 10). Second, we do a reference test to measure biophotons without any treatments for samples.

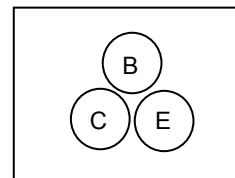


Fig. 10 Areas C, E and B

If we calibrate background noises, Area B is also needed for background noise. Then, measurement 1 (M1) is done without any samples, and measurement 2 (M2) is done with samples at C & E. Background noises of C & E of M2 can be calibrated by the ratios of background noises in M1. In actual tests, areas C & E are made to fit shapes of samples.

Measured values of intensities per unit pixels are assumed as follows.

$$\begin{aligned} \text{Area E:} & S_1 = a_1 D_1 \\ \text{Area C:} & S_2 = a_2 D_2 \end{aligned}$$

Here, S_1 = measured value of E; a_1 = sensitivity of E; D_1 = true value of E; S_2 = measured value of C; a_2 = sensitivity of C; and D_2 = true value of C. If we assume that $D_1 = D_2$, J value of the test (J_0) will be described as,

$$J_0 = \ln (S_1 / S_2) = \ln (a_1 D_1 / a_2 D_2) = \ln (a_1 / a_2)$$

Next, we do a conditioned test in which experimental samples are treated by laying-on-of-hands. If the intensity of experimental samples is multiplied by β times after the treatment, J value of the test (J_1) can be described as below.

$$\begin{aligned} J_1 &= \ln (S_1 / S_2) \\ &= \ln (a_1 D_1 / a_2 D_2) \\ &= \ln \beta + \ln (a_1 / a_2) \end{aligned}$$

Therefore, the difference between J_1 and J_0 is only the effect of the treatment.

$$J_1 - J_0 = \ln \beta$$

Similarly, we can cancel the bias of the growing direction of samples.

Here, in a reference test, D_1 is the true intensity of the vine side sample and D_2 is the true intensity of

the flower side sample. If we assume that D_1 is multiplied by γ times for D_2 , J values can be calculated as follows.

$$J_0 = \ln (a_1 D_1 / a_2 D_2) = \ln \gamma + \ln (a_1 / a_2)$$

$$J_1 = \ln (a_1 D_1 / a_2 D_2) = \ln \beta + \ln \gamma + \ln (a_1 / a_2)$$

Therefore, the effect of healing ($\ln \beta$) will remain if we calculate the difference between J_1 and J_0 .

Last, we can easily learn the effect of the treatments by comparing J values if we always use the same methods of making and arranging samples. In other words, new system biases will be generated if we change sample directions or randomize sample positions at every experiment.

Item 7), delayed luminescence (DL), can be ignored, at least in our measuring system. One of the reasons is that wave length of our system is 280-650nm (sensitivity: 60mA/W at 400nm) which is visual light only, not near-infrared. However, the most important point is considered as the distance between lens and samples. We can measure only phenomena with very strong intensity of photons because the lens of I.I. is 250mm from the samples (Fig. 11).

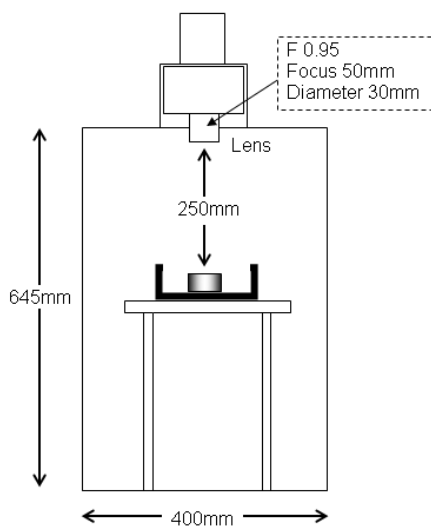


Fig. 11 Distance Between Lens and Samples

When living plants are damaged by insects or bacteria, oxygen in the air contacts cytoplasm of the plants. Immediately, the plants start their defense systems and increase intensity of biophotons at the wound. One of the reasons for using pieces of cucumber as samples is that the intensity of biophotons is very strong because the whole measuring area of the sample is the damaged surface. Another reason is that it is easy to observe natural reactions of defense systems of the plants. It is easy to

keep living states during measurements because we can make samples with enough thickness to overcome the drying process.

We have adjusted the distance between lens and samples to detect only strong photons emitted from the defense systems. Intensity of DL is relatively much weaker (less than 1/100 of the damaged surface). Therefore detection of DL will become difficult if the decay time for about 30 seconds is established before measurements.

4. Comparing Healing and Heat/Lighting

It is unlikely that a healer covers the Petri dish with both hands in actual experiments. The above discussions suggest that the shadow effects of the hands can be ignored. However, there is a possibility that the shadow and heat of hands may cause some complex effects.

In the present section, we discuss the possibility through comparison of healing data with previously obtained thermal/screened data and additional data of screened, thermal and lighting (non-treatment) conditions.

4-1. Samples & measurements The method of making/arranging samples and instruments was the same as in previous studies. Four sample pairs were made from one cucumber, and biophotons were measured for 18 h after treatments.

4-2. Conditions of treatments Conditions were thermal treatment at 40°C, screened treatment, thermal and screened treatment, and non-treatment (samples were exposed to room lighting). Each treatment was done for 30 minutes under usual fluorescent room lights; room temperature was 24°C. The Petri dishes were covered with a glass cover during treatments.

Table 1 lists conditions.

Table 1 Conditions

Treatment	Experiment	Control
Healing	About 100-550 lx	250-550 lx
Thermal	40°C, 10 lx	10 lx
Screen	10 lx	250-550 lx
Thermal and Screen	40°C, 10 lx	250-550 lx
Non-treatment	550 lx	550 lx

In the thermal treatment, an aluminum kettle with 2L water of 40°C was set on a metal grid covering the experimental dish. The distance between the surface of the dish and the bottom of the kettle was 1cm. And, the control dish was covered by a screen. In the screened test, a screen covered the experimental dish, and the control was exposed to the room light. In the thermal and screened test, an aluminum kettle with 2L

water of 40°C was set on a metal grid covering the experimental dish. The distance between the surface of the dish and the bottom of the kettle was 1cm. And, the control dish was exposed to the room light. In the non-treatment, both dishes were exposed to the room light.

4-3. Results For each sample, accumulation of photons over 18 h was converted to a value per 10000 pixels. The value minus background noise was defined as the intensity of biophotons from a sample.

The intensities of experiments I_E and controls I_C were checked for each pair by Wilcoxon signed-rank test. Next, J value, which is natural logarithm of the ratio of I_E to I_C , was calculated, and the difference among treatment groups was checked by ANOVA.

Table 2 shows p values of Wilcoxon test and J values. There was a very significant difference of intensities between experiments and controls in healing ($p = 6.5 \times 10^{-7}$, two tails).

Table 2 Results

Treatment	n	I_E	I_C	$I_E - I_C$	p	J
Healing	106	88192	75890	12303	6.5×10^{-7}	0.142
Thermal	32	77966	76435	1531	0.501	0.005
Screen	31	57270	55038	2232	0.308	0.045
Thermal and Screen	16	64862	63295	1567	0.535	0.028
Non-treat.	15	69618	69857	-238	0.910	0.003

Fig. 12 shows averages of J values and 95% confidential intervals of all groups. Only J value of the healing treatment was not equal to zero (ANOVA, $p = 0.030$). In addition, if we compared healing and non-healing treatments, the difference of J values was also significant ($p = 0.001$, t-test, two tails).

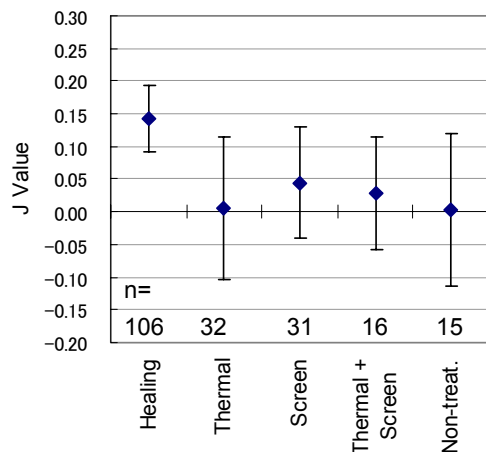


Fig. 12 J values and 95% Confidential Intervals

5. Discussions and Conclusions

The distribution of J value was a normal distribution and we concluded J value had sufficient validity as an index.

Variation of intensities of biophotons of samples, differences of speed of drying or the rate of condensing of photons, drifts of temperature and background noise, effects of delayed luminescence, difference of sensitivities of the measuring system, these biases were concluded to not have serious influence on the results.

In the healing treatment, the intensity of biophotons of experimental samples was significantly larger than the intensity of controls, and J value was not zero. The method of making/arranging samples and measurements was the same. Therefore, we concluded that the healing effects were not results of heat or shadow of the hands. However, in further studies, it is necessary to compare healing effects with other effects to learn details of the phenomenon mechanisms.

J values were almost equal to zero in non-healing conditions. Therefore calibration of sensitivity was not needed for the present data, and we considered that $J = 0.142$ was the true value of healing effects. Moreover, about a half of the 14 healers were beginners who had experiences of healing for less than 3 years or 100 clients. Our measuring method had enough practicality to detect the phenomenon.

In our method, the extent of effects of non-contact healing was estimated from the intensity of biophotons which were generated by activated defense systems of the plants. However, the measuring time was 18 h and not short. If we want to improve the efficiency of measurements, there are two possibilities. One is to accelerate the speed of the bio-chemical reactions of the defense systems. The other is to increase the number of instruments to be used. Since change of the experiment design is undesirable, the latter is more realistic than the former, if funding can be obtained.

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