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# Regulatory effect by the thermal stimulation on the excitation and/or suppression point in Ryodoraku that show(s) deviation from the normal range on Ryodoraku (Meridian) Chart

—Effect of electronic thermal stimulation device (electronic moxa) especially on excitable point—

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Keyword: Ryodoraku, Meridian, Thermal Stimulation, Electronic Moxa

## Abstract

**Aim of research** 1. In order for a person to obtain a healthy body and maintain it, he / she needs to take an active approach. 2. It would be very helpful if you could adjust Ryodoraku "Meridians" at home. 3. As a stimulus for self-adjusting Ryodoraku, warm moxibustion is preferred. 4. Is it possible to adjust the Ryodoraku by stimulating warm moxibustion?
**Methods** Subject: 56.6 ± 11.0 years old (M7, F7) healthy volunteers Measurement: All Ryodoraku measurements (Skin conduction current measurement) Stimulation: Thermal stimulation by electronic warm moxibustion device Stimulation site; Ryodoraku excitement point showing the lowest current value Procedure: Measurement → Stimulus → Interval 30 minutes → Remeasurement Statistics: Excel (descriptive statistics, hypothesis tests, etc.), StatFlex 4.2 (principal component analysis)
**Results** ① Point to check Does electronic moxa change the current of Ryodoraku by thermal stimulation? How much current fluctuates? What is the relationship between current fluctuations and the physiological range on the Ryodoraku chart? In which direction does the current before and after the stimulus fluctuate with respect to the physiological range?
**Results** ② When viewed from the measured current value → The amount of current increased slightly. When viewed from the current value on the Ryodoraku chart → In particular, the F system Ryodoraku current increased. When viewed from fluctuation of current value → There was no significant fluctuation in the current value. When viewed from Ryodoraku average value → There was no significant mean deviation. When viewed from the physiological range of Ryodoraku Chart, and When viewed from the fluctuation of the Ryodoraku Chart → Compared to before stimulation, the number of Ryodoraku deviating from the physiological range was slightly decreased after stimulation. When viewed from principal component analysis → The current before stimulation fluctuated in a direction away from the physiological range, but fluctuated in a direction approaching the physiological range after stimulation.
**Discussion** We consider that the autonomic nervous system is systemically activated because the current of all Ryodoraku inc24reased by thermal stimulation with electronic moxa. The fluctuations in the current value and the average deviation are not remarkable because the stimulus was only once, and the influence of each Ryodoraku and individual differences. We believe that greater fluctuations can be expected if the stimulation is repeated several times on a regular basis. As a result, individual differences are considered to decrease. If there is a large fluctuation, the impact on the all Ryodoraku adjustment (approaching the physiological range) will also be significant. For these verifications, it is considered necessary to examine not only the excitable point but also the stimulus at the suppression point and the current after frequent stimulation.
**Conclusion** 1. Thermal stimulation with electronic moxa increases the all Ryodoraku current. 2. It was suggested that there was no significant fluctuation in the current value, but it was also influenced by each Ryodoraku and individual differences. 3. Ryodoraku deviating from the physiological range slightly decreased. 4. Before stimulation, it fluctuated in a direction away from the physiological range, and after stimulation, it fluctuated in a direction approaching the physiological range. 5. From the above, it is suggested that the thermal stimulation by the electron moxa to the excitable point can adjust the Ryodoraku "meridian". Further, in order to establish a detailed adjustment method, an additional test is required. In particular, a follow-up test with different stimulation sites such as suppression points, a follow-up test with increased stimulation several times, and clinical research are also desired.
**Acknowledgment** We would like to express our gratitude for the cooperation with CHUO Co., Ltd and Kurashiki University of Science and The Arts. In the results of this study, it should be clearly stated that there are no conflicts of interest between the performer and the above industry.

# I. Introduction

To maintain health, he / she pay attention to diet, exercise and play sports. In addition, Oriental medicine folk remedies such as yoga, massage, and shiatsu are often they used. The former exercise is an active method and is especially preferred by young people. The latter is a passive method and seems to be preferred by the elderly [1].

In Japan, folk remedies have traditionally been practiced with physical therapy to apply acupressure or moxibustion to acupuncture points or meridians [2]. A long time ago, moxibustion was used to treat and prevent illnesses in acupuncture points, which is described in ancient Chinese literature, "A Thousand Gold Pieces Prescriptions (Qian-jin-fang; Ch`ien-chin-fang) Vol. 29". Being able to evaluate (diagnose: judge) acupoint therapy and Ryodoraku “meridian” therapy at home (so-called self-regulation) will help in treating and preventing any illness that may be encountered in the future [3].

In other words, obtaining and maintaining a healthy body requires active efforts on your own, and it is helpful if you can self-adjust Ryodoraku at the home.

It would be very helpful if you could adjust Ryodoraku “Meridians” at home. It would be very useful to have a measuring instrument that can measure Ryodoraku at home, or a stimulator that you to adjust Ryodoraku yourself [4、5].

As a stimulus for self-adjusting Ryodoraku, warm moxibustion is preferred [6]. If it is a normal moxibustion (heat-transmitting moxibustion), you may burn yourself and see a medical institution.

However, if it is a warm moxibustion, the probability will be greatly reduced. Among other warm moxibustions, a safer and more effective method would be an electronic warm moxibustion device.

The reason is that it can be given safely by adjusting the thermal stimulus appropriately without using fire.

Is it possible to adjust the Ryodoraku by stimulating warm moxibustion? This needs to be tested and examined, and if it is found to be effective, Ryodoraku “meridian” treatment at home will be possible.

# II. Methods

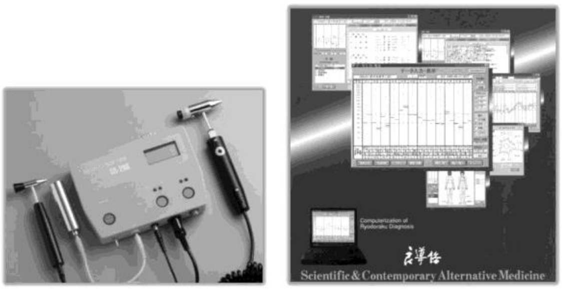
**Subjects：**

The subjects were 14 healthy volunteers who had no current medical history or medical history that would interfere with daily life, recruited while explaining the purpose of the study, and agreed to participate.

The gender ratio was M7 ： F7, and the average age was 56.6 ± 11.0 years old. Since the average age was relatively high, we expected Ryodoraku's current value to be low and the intensity of stimulation to be high.

**Measurement:**

All Ryodoraku measurements (Skin conduction current measurement). Setting were voltage 12V, current 200μA (short circuit), energization for 0.75 seconds [Fig.2-1]. All measurements were performed by the same examiner. Since Ryodoraku measurement is related to autonomic nervous function, the measurement was performed without eating a noon meal.




Neurosofter DS-208S　　Neuro System Vision (NSV)

**Fig.2-1 Ryodoraku measuring device**

The skin conduction current measurement of the body surface measurement point was performed using a Neurosofter DS-208S, and the data was subjected to digital display / analysis and the using a Neuro System Vision (NSV). Both Ryodorau devices were from RYODORAKU RESEARCH INSTITUTE, LTD.

**Stimulation:**

Thermal stimulation by electronic warm moxibustion device [Fig.2-2]. Stimulation site; Ryodoraku excitement point showing the lowest current value [Fig.2-3], Temperature setting: high temperature 60 ± 2°C 3 seconds x n times, stimulation area: about φ7mm 38mm$^2$. The stimulation was made until the subject felt “hot”. All stimuli were performed by the same examiner.

**Procedure:**

**a.** Measurement →
**b.** Stimulus →
**c.** Interval 30 minutes →
**d.** Remeasurement

In the interval time, the same daily activities were performed, not so-called breaks.

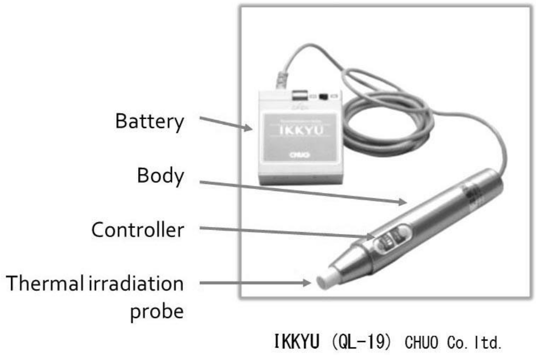



**Fig.2-2 Electronic thermal stimulation device (electronic moxa)**

IKKYU (QL-19) was used to stimulate the subject to feel "hot". The stimulating part was applied to Ryodoraku's excitement point "one part (left and right)" that showed the lowest value in the Ryodoraku data of each subject. The electronic moxa was made by CHUO Co.ltd.

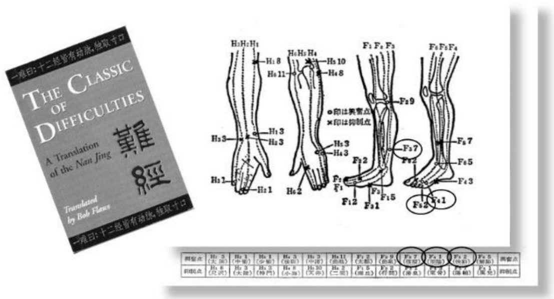



**Fig.2-3 Exciting / suppressing point**

It is known to use "supplement acupoint" and "drain acupoint" as a method of adjusting meridians based on the classic "The *Nan Jing*"＊. In Ryodoraku, supplement acupoint used as the "exciting point" and the drain acupoint is used as the "suppressing point" to help adjust Ryodoraku. In this study, the excitement points of $F_3$, $F_4$ and $F_5$ indicated by ○ were often used.

＊Sixty-nine difficulties of The *Nan Jing*, one of the oldest existing medical books.

**Statistics:**

Excel (descriptive statistics, hypothesis tests, etc.), StatFlex 4.2 (principal component analysis)

In Excel, the average value, standard deviation, coefficient of variation (CV), t-test, correlation test, etc. were performed. StatFlex (general-purpose statistical software) performed [8,9]principal component analysis, which is one of multivariate analysis [7].

**Principal component analysis:**

This is a method of multivariate analysis that synthesizes several "principal components" that represent the total variation from a large number of correlated variables (Ryodoraku current) by a small number without correlation.

In this study, the eigenvector of each principal component that has an eigenvalue of 1 or more and a cumulative contribution rate close to 70% is used as the fluctuation direction of the Ryodoraku current [8,9].

## III. Results

**Point to check:**

- Does electronic moxa change the current of Ryodoraku by thermal stimulation?
- How much current fluctuates?
- What is the relationship between current fluctuations and the physiological range on the Ryodoraku chart?
- In which direction does the current before and after the stimulus fluctuate with respect to the physiological range?

A) When viewed from the measured current values before and after stimulation [Fig.3-1], the amount of current generally increased slightly after stimulation.

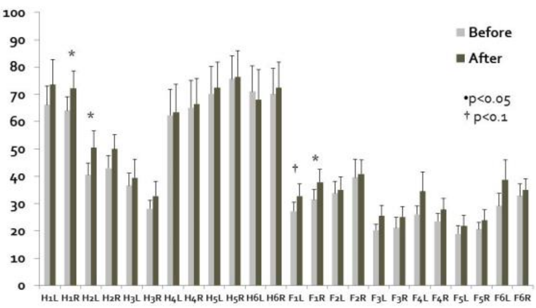



**Fig.3-1 Average current value (μA) of each Ryodoraku before and after stimulation**

Almost all Ryodoraku currents increased after stimulation. In particular, the currents of Ryodoraku for $H_1$, $H_2$, $F_1$, $F_4$, and $F_6$ increased visually. Statistically, $H_1R$, $H_2L$, and $F_1R$ were significantly different ($p<0.05$), and $F_1L$ showed a trend ($p<0.1$). However, there was no significant difference in other Ryodoraku.

B) When viewed from the increase or decrease of each Ryodoraku current value after stimulation Fig.3-2), many Ryodoraku increased.

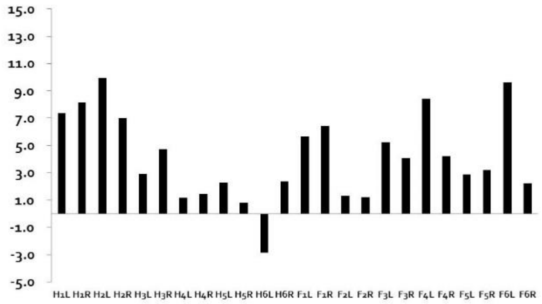



**Fig.3-2 Increase / decrease current of each Ryodoraku after stimulation (μA)**

Almost all Ryodoraku current values increased after stimulation. Except for $H_6L$, the average increase was about 4.2 ± 3.2 (mean ± SD) μA. The maximum value was close to 10 μA.

C) When viewed from the current value on the Ryodoraku chart Fig.3-3), the current of F-type Ryodoraku increased.

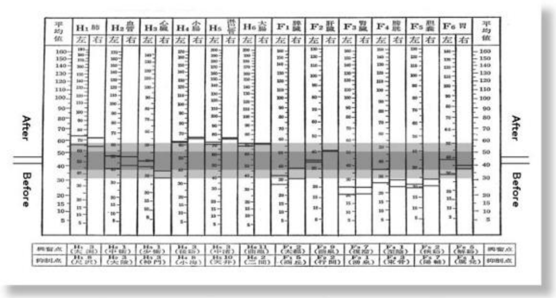



**Fig.3-3 Average current value (μA) of each Ryodoraku on the Ryodoraku chart before and after stimulation**

Current values are shown in the Ryodoraku chart. The average current value and the physiological range on the chart are shown in bottom line before stimulation and in upper line after stimulation. Both the average current value and the physiological range were shifted upward after stimulation.

D) When viewed from the coefficient of variation of the current value Fig.3-4), no significant variation was observed in the current value.

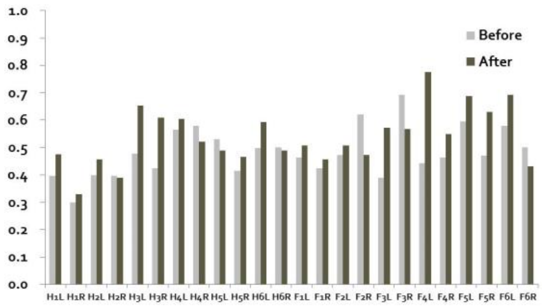



**Fig.3-4 Coefficient of variation (CV) of each Ryodoraku before and after stimulation**

The coefficient of variation (CV) is the standard deviation divided by the arithmetic mean.

CV = SD / Mean

The coefficient of variation indicates how much the variation has occurred regardless of the magnitude of the current before and after stimulation. In other words, it is a variation index different from variance and standard deviation. In this study, the coefficient of variation of $H_3$, $F_4$, $F_5$, and $F_6$ increased relatively and $F_2$ and $F_3$ seemed to decrease after stimulation. $F_4$ and $F_5$, which have relatively increased coefficients of variation, are Ryodoraku given thermal stimulation.

E) When viewed from the Ryodoraku mean Fig.3-5), no significant mean deviation was observed.

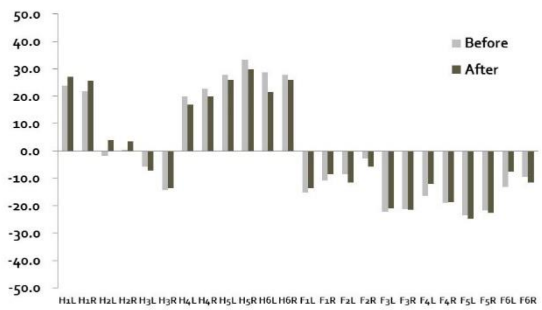



**Fig.3-5 Mean deviation (μA) of each Ryodoraku before and after stimulation**

In the average deviation of the current values, Ryodoraku of $H_4$, $H_5$, and $H_6$ was above the average value, and all of the F systems were below the average value.

F) When viewed from the physiological range of the Ryodoraku chart Fig.3-6), the number of Ryodoraku deviating from the physiological range decreased slightly after stimulation compared to before stimulation.

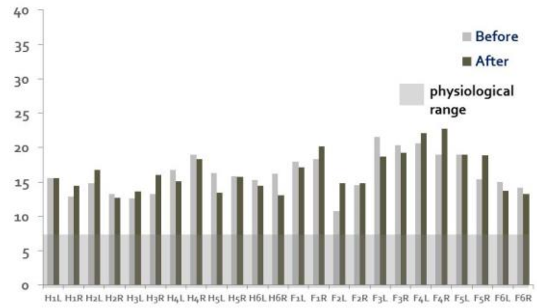



**Fig.3-6 Average distance from the physiological range of each Ryodoraku before and after stimulation (mm)**

The green range up to 0-7mm is the physiological range. However, the distance is displayed using an absolute value. There were some Ryodoraku farther away from the physiological range after stimulation. The average distance was 15.8 mm before stimulation and 15.7 mm after stimulation.

G) When viewed from the coefficient of variation with respect to the distance from the physiological range of each Ryodoraku before and after stimulation Fig.3-7), several Ryodoraku slightly increased or decreased.

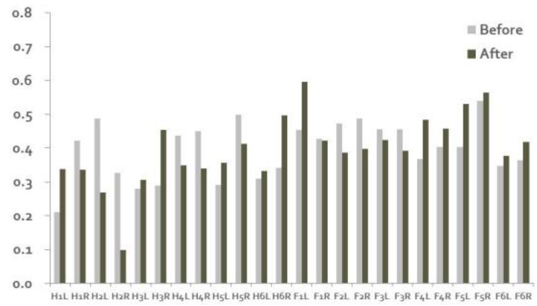



**Fig.3-7 Coefficient of variation (CV) for the distance from the physiological range of each Ryodoraku before and after stimulation**

In the coefficient of variation of the distance from the physiological range, Ryodoraku of $H_2$, $H_4$, and $F_2$ decreased after stimulation compared with before stimulation. In contrast, Ryodoraku of $H_3$, $H_6$, $F_1$, $F_4$, and $F_5$ seemed to increase after stimulation.

H) When viewed from the eigenvectors of the principal component analysis Table 1), Fig.3-8 to 3-11), the eigenvectors that are separated from the physiological range before the stimulation are changed to eigenvectors that approach the physiological range after the stimulation.


**Each Ryodoraku principal component before and after stimulation**

| Before | z1 | z2 | z3 | After | z1 | z2 | z3 |
|---|---|---|---|---|---|---|---|
| H1L | 0.22 | 0.23 | 0.11 | H1L | 0.25 | -0.14 | 0.19 |
| H1R | 0.23 | 0.29 | 0.07 | H1R | 0.23 | -0.15 | -0.05 |
| H2L | 0.17 | 0.36 | 0.23 | H2L | 0.22 | 0.04 | 0.39 |
| H2R | 0.19 | 0.26 | 0.19 | H2R | 0.25 | 0.04 | 0.22 |
| H3L | 0.19 | 0.22 | 0.19 | H3L | 0.24 | -0.01 | 0.35 |
| H3R | 0.17 | 0.22 | 0.29 | H3R | 0.24 | -0.01 | 0.34 |
| H4L | 0.29 | -0.06 | -0.07 | H4L | 0.27 | -0.11 | -0.19 |
| H4R | 0.27 | -0.00 | -0.24 | H4R | 0.21 | -0.22 | -0.17 |
| H5L | 0.28 | -0.11 | -0.08 | H5L | 0.28 | -0.11 | -0.11 |
| H5R | 0.25 | -0.05 | -0.28 | H5R | 0.22 | -0.16 | -0.35 |
| H6L | 0.29 | -0.11 | -0.08 | H6L | 0.24 | -0.18 | -0.17 |
| H6R | 0.27 | -0.11 | -0.21 | H6R | 0.23 | -0.13 | -0.33 |
| F1L | 0.08 | -0.30 | 0.36 | F1L | 0.14 | 0.30 | -0.01 |
| F1R | -0.03 | -0.36 | 0.31 | F1R | 0.01 | 0.39 | 0.02 |
| F2L | 0.25 | -0.13 | -0.08 | F2L | 0.22 | -0.03 | 0.06 |
| F2R | 0.27 | -0.04 | 0.11 | F2R | 0.20 | -0.04 | -0.04 |
| F3L | -0.05 | -0.08 | 0.37 | F3L | 0.17 | 0.30 | 0.04 |
| F3R | 0.10 | -0.27 | 0.24 | F3R | 0.16 | 0.33 | -0.16 |
| F4L | 0.11 | -0.31 | 0.10 | F4L | 0.13 | 0.33 | -0.11 |
| F4R | 0.03 | -0.20 | 0.22 | F4R | 0.06 | 0.35 | -0.09 |
| F5L | 0.14 | -0.13 | -0.17 | F5L | 0.17 | 0.28 | -0.18 |
| F5R | 0.20 | -0.21 | -0.11 | F5R | 0.14 | 0.24 | -0.18 |
| F6L | 0.23 | 0.01 | 0.07 | F6L | 0.21 | 0.02 | 0.24 |
| F6R | 0.18 | -0.01 | 0.17 | F6R | 0.15 | -0.05 | 0.04 |
| | | | | | | | |
| eigenvalue | 9.53 | 3.96 | 2.84 | eigenvalue | 11.20 | 4.93 | 1.91 |
| Contribution rate | 0.40 | 0.17 | 0.12 | Contribution rate | 0.47 | 0.21 | 0.08 |
| Cumulative contribution rate | 0.40 | 0.56 | 0.68 | Cumulative contribution rate | 0.47 | 0.67 | 0.75 |

The principal components necessary for the analysis were selected based on the contribution rate, cumulative contribution rate, and eigenvalue size of each principal component before and after stimulation. The selected principal component was the principal component up to the second principal component, and the variation direction was analyzed by the eigenvector of the principal component.


**Fig.3-8 Fluctuation direction of each Ryodoraku before stimulation (eigenvector of the first principal component <z1>)**

Except for the Ryodoraku eigenvectors of F1, F3, and F4, most Ryodoraku eigenvectors were recognized to rising or descending as a group.

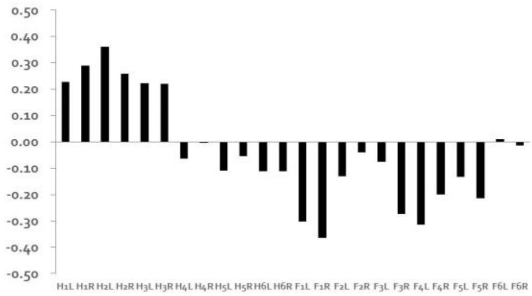



**Fig.3-9 Fluctuation direction of each Ryodoraku before stimulation (eigenvector of second principal component <Z2>)**

Ryodoraku's eigenvectors from H1L to H3R of the H system, except for the H4 Ryodoraku eigenvector, were recognized to rising, and the R5 and H6 Ryodoraku eigenvectors were recognized to descending.
Moreover, it was recognized that the F system is a component in which most Ryodoraku eigenvectors except F6 descending.

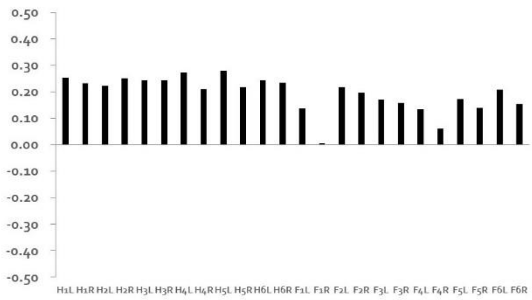



**Fig.3-10 Fluctuation direction of each Ryodoraku after stimulation (eigenvector of the first principal component <z1>)**

Except for the Ryodoraku eigenvector of F1R, most Ryodoraku eigenvectors were recognized to be components that rising or descending as a group. This component was almost the same as the fluctuation direction of each Ryodoraku eigenvector before stimulation.

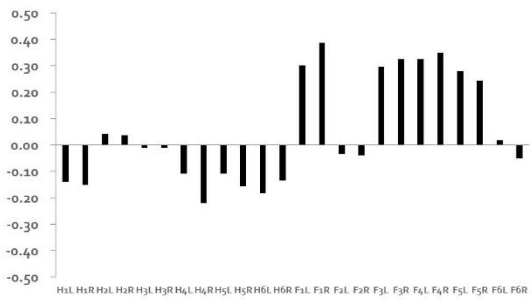



**Fig.3-11 Fluctuation direction of each Ryodoraku after stimulation (eigenvector of second principal component <Z2>)**

Except for the H2 and H3 Ryodoraku eigenvectors, the H system Ryodoraku eigenvectors were recognized to be descending components. On the other hand, it was recognized that most of the F system except the Ryodoraku eigenvectors of F2 and F6 are rising components.

I) When viewed from the fluctuation of the Ryodoraku chart Fig.3-12, 3-13), the current before stimulation fluctuated in a direction away from the physiological range, but fluctuated in a direction approaching the physiological range after stimulation.

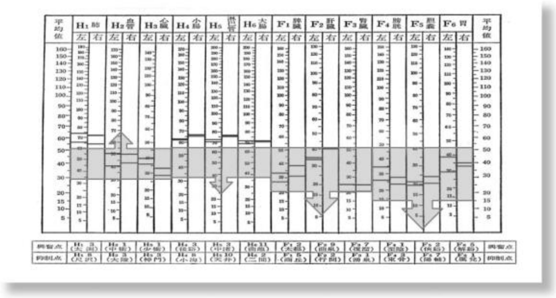


**Fig.3-12 Fluctuation direction of each Ryodoraku on the Ryodoraku chart before stimulation**

The eigenvectors in the principal component analysis were superimposed on the Ryodoraku chart.

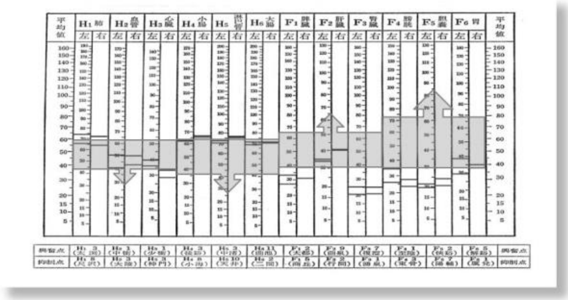


**Fig.3-13 Fluctuation direction of each Ryodoraku on the Ryodoraku chart after stimulation**

This is the result of superimposing the eigenvectors in the principal component analysis on the Ryodoraku chart.

## IV. Discussion

We consider that the autonomic nervous system is systemically activated because the current of all Ryodoraku increased by thermal stimulation with electronic moxa [10].

The fluctuations in the current value and the average deviation are not remarkable because the stimulus was only once, and the influence of each Ryodoraku and individual differences.

We believe that greater fluctuations can be expected if the stimulation is repeated several times on a regular basis. As a result, individual differences are considered to decrease.

If there is a large fluctuation, the impact on the all Ryodoraku adjustment (approaching the physiological range) will also be significant.

In addition, in order to verify these fluctuations and effects, it is necessary to examine not only the "excitation point" but also the "suppression point", and the current after repeated stimulation.

## V. Conclusuion

- Thermal stimulation with electronic moxa increases the all Ryodoraku current.
- It was suggested that there was no significant fluctuation in the current value, but it was also influenced by each Ryodoraku and individual differences.
- Ryodoraku deviating from the physiological range slightly decreased.
- Before stimulation, it fluctuated in a direction away from the physiological range, and after stimulation, it fluctuated in a direction approaching the physiological range.

From the above, it is suggested that the thermal stimulation by the electron moxa to the excitable point can adjust the Ryodoraku "meridian".

Further, in order to establish a detailed adjustment method, an additional test is required. In particular, a follow-up test with different stimulation sites such as suppression points, a follow-up test with increased stimulation several times, and clinical research are also desired.

## Acknowledgement

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