

1 Comparison of the cosmetic effects of acupuncture stimulation  
2 and facial care: an examination through the evaluation of skin  
3 condition and physical and mental effects

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26 論文の種類 (原著)

27

1 1. Introduction

2 In recent years, cosmetic acupuncture and moxibustion have  
3 gained attention as a field for improving skin conditions from a  
4 cosmetic perspective and is expanding as a new research area.  
5 Most recent studies used surveys that investigated subjective  
6 cosmetic effects on patients, while others, despite being  
7 clinical studies, used evaluation methods that focused on  
8 subjective factors. Some of these studies have shown that  
9 acupuncture stimulation causes “sagging,” “lifting,” and “dry  
10 skin.”

11 Since the year 2000, there has been a gradual increase in the  
12 literature that attempts to clarify cosmetic effects using  
13 objective indicators <sup>(1),(2)</sup>. Among them, Uesaka et al.<sup>(3)</sup>  
14 reported that the amount of water loss decreased due to  
15 acupuncture stimulation in the treatment group compared to the  
16 control group. Ogino et al.<sup>(4)</sup> reported in an examination using  
17 magnetic resonance imaging that acupuncture stimulation  
18 reduced strong clenching and reduced the difference in size  
19 between the left and right masseter muscles. Acupuncture  
20 stimulation has been shown to increase blood flow to the  
21 face<sup>(5)</sup>. Although the mechanism of action of acupuncture  
22 stimulation is not clear, its effectiveness is gradually becoming  
23 apparent.

24 However, the characteristics of the cosmetic effects of  
25 acupuncture stimulation compared to other cosmetic  
26 interventions and the differences in the effects are yet to be  
27 investigated in detail. A previous study compared the effect of  
28 adding acupuncture stimulation to facial pressure stimulation  
29 for facial esthetics (manual tactile pressure stimulation)<sup>(6)</sup>.  
30 There was no objective conclusion on the effectiveness of

1 acupuncture stimulation for facial esthetics because the  
2 evaluation was based on subjective indices. Furthermore, the  
3 options for facial esthetic treatment available for patients to  
4 choose from are limited.

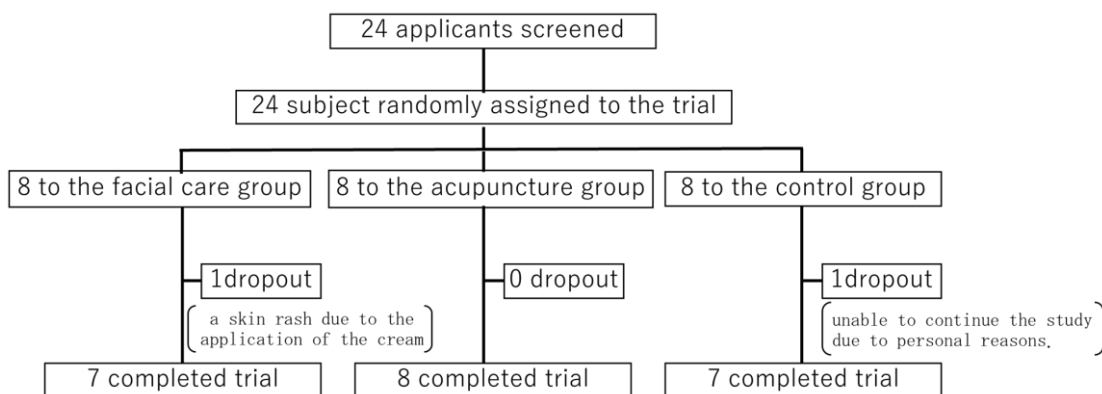
5 Herein, we report on the difference between the effects of  
6 facial care treatment currently available on the market and  
7 acupuncture stimulation on the face, using subjective and  
8 objective indicators.

9

## 10 2. Methods

### 11 2.1 Research participants (Fig. 1)

12 The participants of this study were healthy adult female in their  
13 20s to 50s, regardless of occupation. Individuals with medical  
14 conditions (symptomatic and pathological), on medications, and  
15 with lifestyle-related habits that could affect the results of this  
16 study were excluded. We excluded those who dropped out of the  
17 study during the study period, developed medical symptoms,  
18 developed diseases, and experienced changes in lifestyle, such  
19 as overdrinking and overeating or lack of sleep on the day prior  
20 to the date of measurement, that could affect the study results.



**Figure 1. Flow diagram**

Twenty-four applicants were recruited through an open call for participants. Afterward, all 24 people were randomly assigned to 3 groups.

After the intervention began, 1 patient in Group F and 1 patient in Group C dropped out.

The final study participants were 7 in Group F, 7 in Group A, and 7 in Group C.

21

## 1 2.2 Study flow

2 The participants were randomly assigned to either the facial  
3 care (Group F), acupuncture stimulation (Group A), or control  
4 (Group C) group.

5 Pre-intervention subjective and objective evaluations were  
6 performed. Afterward, Groups F and A underwent intervention  
7 for 1 month. Group C was only followed up and interviewed  
8 (i.e., asked whether there were any life events that met the  
9 exclusion criteria) at the same frequency as the other  
10 intervention groups.

11 In each group, the same evaluations performed before the  
12 intervention were performed after the intervention was  
13 completed, and intergroup and intragroup comparisons were  
14 performed.

15

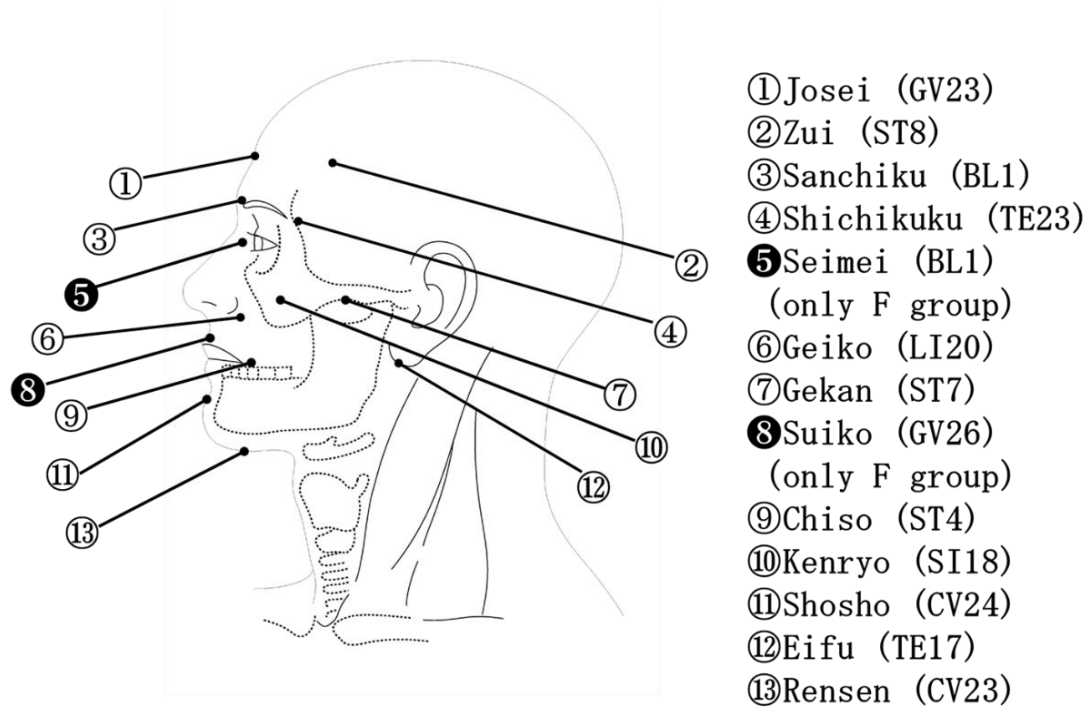
## 16 2.3 Intervention method (Fig. 2)

17 Generally, each intervention was performed twice a week.

### 18 2.3.1 Facial care group (Group F)

19 “Oriental facial care” produced by C’BON COSMETICS Co.,  
20 Ltd. (Tokyo, Japan) was applied from the face to the neck. In  
21 this group, the cream (which contains no whitening agents and  
22 mainly contains ingredients such as squalene and  
23 caprylic/capric triglyceride) was lightly and thoroughly rubbed  
24 on the face of participants with both palms, and the acupuncture  
25 points were pressed with the third finger of both hands. We  
26 performed this action thoroughly on the entire face and neck of  
27 the participants. Compression was applied on the following  
28 acupuncture points: Josei (GV23), Zui (ST8), Sanchiku (BL1),  
29 Shichikuku (TE23), Seimei (BL1), Geiko (LI20), Gekan (ST7),  
30 Suiko (GV26), Chiso (ST4), Kenryo (SI18), Shosho (CV24),

1 Eifu (TE17), and Rensen (CV23). The treatment time was within  
 2 30 min, including changing clothes and wiping off the cream.



**Figure 2. Stimulation sites**

In Group F, compression methods were performed at 23 locations, including 13 acupuncture points on the left and right side of the face. Due to safety reasons, acupuncture stimulation was performed at 19 places including 11 acupuncture points on the left and right in Group A.

3

#### 4 2.3.2 Acupuncture stimulation group (Group A)

5 Single-use acupuncture needles (disposable acupuncture No. 16  
 6 acupuncture needles; Seirin Corporation, Shizuoka, Japan) were  
 7 used on the same acupuncture points as those in Group F. After  
 8 the needle was inserted to a depth of approximately 3–10 mm in  
 9 each acupuncture point, acupuncture stimulation was performed  
 10 for about 10 min. The duration of one treatment session was  
 11 approximately 30 min. To ensure safety, the Seimei (BL1, inner  
 12 eye angle close to the eyeball) and Suiko (GV26, strong pain  
 13 during acupuncture stimulation) acupuncture points used in  
 14 Group F were excluded.

#### 15 2.3.3 Control group (Group C)

16 Interviews were conducted at least once a week as follow-up

1 within the same period as that in Groups F and A.

2

## 3 2.4 Evaluation method

### 4 2.4.1 Subjective evaluation

#### 5 2.4.1.1 Psychometrics

6 The following evaluations were performed to determine the  
7 mental and physical cosmetic effects of the skin interventions.

#### 8 • Subjective happiness scale

9 This is a 12-item questionnaire in which the higher the score,  
10 the stronger the feeling of happiness.

#### 11 • Narcissistic Vulnerability Scale

12 This is a 20-item questionnaire that evaluates narcissistic  
13 vulnerabilities and calculates the final score based on four  
14 factors including distrust of others, pervasive negative  
15 emotionality, entitlement, and self-absorption. For each factor,  
16 the higher the score, the stronger the tendency.

#### 17 • Self-monitoring scale

18 This is a 25-item questionnaire that evaluates self-management  
19 and control, and the final score is based on four factors  
20 including extroversion, other-directedness, acting, and total  
21 score. For each factor, the higher the score, the stronger the  
22 factor.

#### 23 • Anger Arousal and Lengthiness Scale

24 This is a 13-item questionnaire that evaluates anger arousal and  
25 lengthiness and is calculated based on three factors including  
26 anger arousal, anger lengthiness, and anger arousal and  
27 lengthiness together.

#### 28 2.4.1.2 Pittsburgh Sleep Quality Index

29 The Pittsburgh Sleep Quality Index (PSQI) was used to evaluate  
30 sleep. The PSQI assesses sleep over the past month and assesses

1 overall sleep quality.

### 2 2.4.1.3 Visual analog scale of skin condition

3 A self-reported visual analog scale (VAS) was used for the  
4 subjective evaluation of skin condition.

5 The VAS uses a standard 100-mm scale, with the left end being  
6 “very satisfied” and the right end being “very dissatisfied.” The  
7 evaluation items were dryness, shine, stickiness, conspicuous  
8 pores, dullness, texture, wrinkles, sagging, tightness after face  
9 washing, and skin condition (comprehensive evaluation).

### 10 2.4.1.4 Lifelog questionnaire

11 This is a daily self-report questionnaire that investigates sleep,  
12 diet, and other lifestyle factors. The evaluation items were  
13 bedtime and wake-up time, sleep quality, number of meals per  
14 day, time spent on chores and housework, and details of  
15 housework, free time, and activities during free time.

16

## 17 2.4.2 Objective evaluation

### 18 2.4.2.1 Cerebral blood flow dynamics measurement (functional 19 near-infrared spectroscopy)

20 To measure cerebral blood flow dynamics, a portable wireless  
21 cerebral activity measuring device (NeU Co., Ltd., Tokyo,  
22 Japan) was used to measure changes in blood flow related to  
23 cerebral activity. The measurement site was the frontal region,  
24 and the measurement was performed in the sitting position.  
25 Light was applied from above the scalp, and the amount of light  
26 returned to the detector was measured. The measured value  
27 indicated the amount of change from the measurement start  
28 time. In this study, load was measured while conducting the  
29 Alternative Uses Test (answering the uses of the presented  
30 illustrations as much as possible).

1 2.4.2.2 Arousal and mental fatigue test

2 The degrees of arousal and mental fatigue were measured using  
3 a central flicker (Handy Flicker HF-II; Knights Co., Ltd.,  
4 Tokyo, Japan).

5 2.4.2.3 Skin condition measurement

6 The water content of the stratum corneum was measured using a  
7 Corneometer® CM825 (Courage+Khazaka electronic GmbH,  
8 Köln, Germany), the amount of water loss on the stratum  
9 corneum (TEWL: transepidermal water loss) was measured using  
10 Tewameter® TM300 (Courage+Khazaka electronic GmbH), and  
11 the skin viscoelasticity was measured using the Cutometer®  
12 MPA580 (Courage+Khazaka electronic GmbH) as indicators R2  
13 (gross elasticity) and R7 (recovery after deformation).

14 Skin color ( $L^*a^*b^*$ ) and the melanin index, hemoglobin index,  
15 and blood hemoglobin oxygen saturation index (Hb SO<sub>2</sub> Index)  
16 were measured using a spectrophotometer (CM-700d; Konica  
17 Minolta Co., Ltd., Tokyo, Japan) on the left and right cheeks.

18 2.4.2.4 Skin shape measurement

19 Tape stripping was performed to evaluate parameters like the  
20 multi-layer peeling area, single-layer peeling area, and  
21 carbonyl protein of the stratum corneum. Measurements were  
22 performed on both cheeks.

23

24 2.5 Statistical analysis

25 All results obtained from the statistical analyses are expressed  
26 as mean  $\pm$  standard deviation. The Kruskal–Wallis test was  
27 performed to compare the effect difference before and after the  
28 intervention in each group, and then the Dann–Bonferroni test  
29 was performed as a post-hoc test. In addition, the Wilcoxon  
30 rank-sum test was performed to compare the effect of the



1 intervention in each group. SPSS v.25 (IBM, Armonk, NY) was  
2 used for all statistical analyses, and the significance level was  
3 set at 5%.

### 4 5 3. Results

#### 6 3.1 Research participants

7 The participants of the study were 24 healthy adult women, but  
8 two dropped out of the study. The final analysis included seven  
9 participants in Group F ( $34.6 \pm 9.0$  years old), eight participants  
10 in Group A ( $43.4 \pm 6.9$  years old), and seven participants in  
11 Group C ( $46.4 \pm 10.0$  years old), totaling 22 participants  
12 ( $41.6 \pm 9.7$  years old). Regarding the reasons for the dropout, one  
13 person in Group F had a skin rash due to the application of the  
14 cream, and one person in Group C was unable to continue the  
15 study due to personal reasons. In addition, for the study  
16 participants who developed skin irritation due to the cream,  
17 spontaneous remission was observed during follow-up.

#### 18 19 3.2 Subjective evaluation (Table 1)

##### 20 3.2.1 Psychological scale

21 In the group comparison, a significant difference was observed  
22 in entitlement in narcissistic vulnerability ( $p=0.002$ , Group F  
23 vs. Group A; Group F vs. Group C) and other-directedness in  
24 self-monitoring ( $p=0.004$ , Group F vs. Group C).

25 In addition, in the intra-group comparison, significant changes  
26 were observed in entitlement in Group F ( $12.3 \pm 2.2 \rightarrow 9.1 \pm 2.4$ ,  
27  $p=0.018$ ), the total score of Group A ( $62.6 \pm 10.1 \rightarrow 65.6 \pm 9.2$ ,  
28  $p=0.034$ ), and others-directedness ( $38.1 \pm 5.6 \rightarrow 41.9 \pm 4.6$ ,  
29  $p=0.018$ ) and acting ( $10.6 \pm 4.0 \rightarrow 12.1 \pm 3.0$ ,  $p=0.026$ ) in Group  
30 C.

1 3.2.2 VAS of skin condition

2 In the intergroup comparison, significant differences were  
3 observed in conspicuous pores ( $p=0.041$ , Group F vs. Group C),  
4 tightness after face washing ( $p=0.020$ , Group F vs. Group C),  
5 and skin condition ( $p=0.022$ , Group A vs. Group C).

6 Furthermore, in the intragroup comparison, significant changes  
7 were noted in conspicuous pores ( $58.6\pm18.7\rightarrow31.6\pm19.9$ ,  
8  $p=0.028$ ), wrinkles ( $41.9\pm18.5\rightarrow25.7\pm13.8$ ,  $p=0.018$ ), tightness  
9 after face washing ( $60.3\pm25.4\rightarrow29.6\pm15.2$ ,  $p=0.018$ ), and skin  
10 condition ( $49.3\pm20.4\rightarrow23.1\pm11.3$ ,  $p=0.034$ ) in Group F, as well  
11 as texture ( $65.0\pm26.5\rightarrow41.9\pm18.8$ ,  $p=0.025$ ) and skin condition  
12 ( $72.6\pm18.5\rightarrow45.0\pm21.4$ ,  $p=0.021$ ) in Group A.

13 3.2.3 PSQI

14 No significant differences in the PSQI were observed in either  
15 the intergroup or intragroup comparisons.

Table1. Results of subjective evaluations

	Facial care group (n=7)		Acupuncture stimulation group (n=8)		Control group (n=7)		p-value
	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention	
<b>Subjective happiness scale</b>							
Subjective happiness	35.1±2.5	36.7±2.1	33.9±2.8	35.1±2.7	34.6±4.3	33.7±4.4	0.074
<b>Narcissistic Vulnerability Scale</b>							
distrust of others	14.9±2.2	13.3±2.9	14.0±2.8	12.9±1.5	16.1±5.2	16.7±4.8	0.159
pervasive negative emotionality	13.6±4.0	14.7±3.6	12.9±4.5	13.0±4.2	15.0±6.5	14.9±3.7	0.553
entitlement	12.3±2.2	<b>9.1±2.4*</b>	10.3±3.7	10.3±3.1	9.6±3.0	10.1±3.6	<b>0.0024, ++</b>
self-absorption	12.4±3.4	10.6±1.4	10.1±2.7	9.6±3.1	12.3±4.1	11.4±5.2	0.603
<b>Self-monitoring scale</b>							
extroversion	29.7±6.8	27.6±5.9	22.8±5.1	24.8±3.6	30.0±7.4	31.3±7.2	0.079
other-directedness	38.0±4.5	36.1±7.0	32.9±6.4	34.0±3.7	38.1±5.6	<b>41.9±4.6*</b>	<b>0.040+</b>
acting	8.3±2.8	8.7±3.7	7.4±2.6	7.5±1.7	10.6±4.0	<b>12.1±3.0*</b>	0.255
TTL	75.0±11.1	71.4±12.7	62.6±10.1	<b>65.6±9.2*</b>	77.1±10.0	80.4±10.9	0.098
<b>Anger Arousal and Lengthiness Scale</b>							
anger arousal subscale	17.4±4.3	16.6±4.4	18.1±2.5	16.5±2.4	16.0±4.1	16.7±4.6	0.168
anger lengthiness subscale	18.7±3.3	18.1±4.5	19.0±2.2	16.6±5.3	17.4±5.4	18.9±3.8	0.111
anger arousal and anger lengthiness subscale	36.1±6.5	34.7±6.8	37.1±4.0	33.1±7.4	33.4±8.7	35.6±8.3	0.069
<b>VAS of skin condition</b>							
dryness	37.3±27.7	14.4±6.7	72.4±30.4	60.8±27.8	56.4±23.8	57.1±32.7	0.138
shine	41.0±30.9	21.4±9.3	40.1±31.0	27.3±26.6	48.3±21.5	45.4±23.7	0.472
stickiness	28.6±26.0	21.1±16.5	35.8±28.6	31.1±26.6	44.9±30.5	32.4±22.9	0.856
conspicuous pores	58.6±18.7	<b>31.6±19.9*</b>	60.6±19.6	46.6±29.1	60.0±26.3	65.9±27.1	<b>0.041+</b>
dullness	44.9±30.1	25.3±15.1	64.5±22.5	48.6±27.3	62.9±27.3	56.1±29.4	0.361
texture	38.3±25.4	24.0±15.7	65.0±26.5	41.9±18.8*	65.7±23.3	67.6±30.6	0.089
wrinkles	41.9±18.5	<b>25.7±13.8*</b>	53.3±18.4	50.6±30.3	65.6±34.6	71.7±33.5	0.076
saggling	32.9±17.2	23.7±14.9	63.8±16.3	55.3±29.3	73.3±34.5	75.4±34.5	0.108
tightness after face washing	60.3±25.4	<b>29.6±15.2*</b>	68.6±33.5	50.4±30.4	56.1±27.4	57.6±29.8	<b>0.020+</b>
skin condition (comprehensive evaluation)	49.3±20.4	<b>23.1±11.3*</b>	72.6±18.5	<b>45.0±21.4*</b>	69.6±23.8	71.6±22.4	<b>0.022+++</b>
<b>Pittsburgh Sleep Quality Index</b>							
PSQI	4.6±1.5	3.4±1.0	4.5±0.9	4.5±2.9	6.3±6.2	6.1±2.1	0.450

The results before and after the intervention in each group are shown. All numerical values are expressed as mean ± standard deviation.

For all intergroup comparisons, Dunn-Bonferroni test was performed as a post-hoc test after the Kruskal-Wallis test. Wilcoxon's rank sum test was performed for intragroup comparison.

P-value: comparison of differences in results before and after intervention in each group (Kruskal-Wallis test)

\*: p<0.05, comparison of results before and after the intervention in each group (Wilcoxon's signed rank sum test)

† : F-C, †† : F-A, ††† : A-C

1 3.3 Objective evaluation (Table 2)

2 3.3.1 Cerebral blood flow dynamics

3 No significant differences were observed in cerebral blood flow  
4 dynamics in either the intergroup or intragroup comparisons.

5 3.3.2 Arousal and mental fatigue test

6 No significant differences were observed in arousal or mental  
7 fatigue in either the intergroup or intragroup comparisons.

8 3.3.3 Skin condition measurement

9 3.3.3.1 Spectrophotometry

10 The left melanin index showed no intergroup differences  
11 ( $p=0.050$ ), while the right melanin index ( $p=0.031$ , Group F vs.  
12 Group A), left  $L^*$  value ( $p=0.042$ , no intergroup difference),  
13 right  $L^*$  value ( $p=0.006$ , Group F vs. Group A), and left  $a^*$   
14 value ( $p=0.038$ , Group F vs. Group C) showed significant  
15 differences.

16 In addition, in the intragroup comparison, significant  
17 differences were observed in the left melanin index  
18 ( $1.1\pm 0.1 \rightarrow 1.0\pm 0.1$ ,  $p=0.018$ ), right melanin index  
19 ( $1.1\pm 0.1 \rightarrow 1.0\pm 0.1$ ,  $p=0.018$ ), left  $L^*$  value ( $66.4\pm 2.1 \rightarrow 67.5\pm 2.0$ ,  
20  $p=0.018$ ), right  $L^*$  value ( $65.9\pm 1.9 \rightarrow 66.8\pm 1.8$ ,  $p=0.018$ ) in  
21 Group F; the left Hb  $SO_2$  index ( $54.2\%\pm 2.9\% \rightarrow 56.0\%\pm 3.3\%$ ,  
22  $p=0.025$ ) in Group A; and the left  $b^*$  value  
23 ( $18.1\pm 2.8 \rightarrow 17.1\pm 2.6$ ,  $p=0.043$ ) in Group C.

24 3.3.3.2 Skin measuring device

25 No significant differences were observed between groups in  
26 stratum corneum water content, TEWL, or skin viscoelasticity.

27 In the intragroup comparison, significant changes were  
28 observed in the left stratum corneum water content in Group F  
29 ( $35.1\pm 13.8 \rightarrow 41.2\pm 15.9$ ,  $p=0.043$ ) and the left R7 skin elasticity  
30 in Group C ( $0.2986\pm 0.0320 \rightarrow 0.2824\pm 0.0396$ ,  $p=0.046$ ).

1 3.4 Stratum corneum measurement  
2 3.4.1 Multi-layer peeling area  
3 No significant differences were observed in multi-layer peeling  
4 in the intergroup and intragroup comparisons.  
5 3.4.2 Single-layer peeling area  
6 No significant differences were observed in single-layer peeling  
7 in the intergroup and intragroup comparisons.  
8 3.4.3 Carbonylated protein  
9 A significant difference was observed in the proportion of  
10 carbonylated protein on the right side ( $p = 0.027$ ) between  
11 Groups F and A.  
12 A significant change was observed in the proportion of  
13 carbonylated protein on the right side in Group A ( $2465.9 \pm 295.8$   
14  $\rightarrow 2760.2 \pm 333.2$ ,  $p=0.025$ ).

## Table 2 Results of objective evaluations

	Facial care group (n=7)		Acupuncture stimulation group(n=8)		Control group(n=7)		p-value
	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention	
<b>Cerebral blood flow dynamics measurement</b>							
IbT change(left S02cm)	0.7±1.0	0.3±0.2	0.4±0.3	0.2±0.4	0.3±0.4	0.3±0.4	0.672
IbT change(right S02cm)	0.6±0.5	0.5±0.2	0.5±0.4	0.2±0.4	0.3±0.3	0.4±0.4	0.881
IbT change(left S01cm)	0.3±0.2	0.3±0.2	0.3±0.1	0.2±0.1	0.2±0.1	0.1±0.3	0.803
IbT change(right S01cm)	0.5±0.3	0.5±0.2	0.5±0.2	0.4±0.2	0.5±0.4	0.3±0.3	0.948
<b>Arousal and mental fatigue test</b>							
flicker red	29.4±2.9	30.2±2.6	29.7±3.7	29.9±3.9	30.5±2.3	31.3±1.9	0.239
flicker green	31.5±3.9	31.7±3.8	31.9±2.8	31.9±2.8	33.4±2.8	33.5±2.9	0.813
flicker yellow	30.9±3.3	32.3±4.1	31.6±2.3	31.8±2.3	32.2±3.0	33.1±2.9	0.172
<b>Spectrocolorimeter</b>							
Melanin index left	1.1±0.1	<b>1.0±0.1*</b>	1.1±0.2	1.1±0.1	1.1±0.1	1.1±0.2	<b>0.050</b>
Melanin index right	1.1±0.1	<b>1.0±0.1*</b>	1.1±0.2	1.1±0.1	1.2±0.2	1.2±0.2	<b>0.031**</b>
Ib index left	1.3±0.4	1.3±0.3	1.3±0.4	1.3±0.3	1.3±0.4	1.4±0.3	0.148
Ib index right	1.4±0.4	1.4±0.4	1.4±0.2	1.5±0.3	1.4±0.3	1.5±0.3	0.657
Ib S02 index(X) left	53.8±6.2	54.8±6.3	54.2±2.9	56.0±3.3*	54.3±6.6	56.1±4.0	0.744
Ib S02 index(X) right	53.3±8.7	54.5±8.1	53.1±3.4	54.0±3.7	54.2±4.5	53.8±4.1	0.335
L* left	65.4±2.1	<b>67.5±2.0*</b>	65.4±2.6	65.5±2.7	64.7±2.0	64.4±1.4	<b>0.042</b>
L* right	65.9±1.9	<b>68.8±1.8*</b>	65.1±2.4	64.5±2.4	64.2±2.3	63.9±2.1	<b>0.008**</b>
a* left	9.8±1.8	9.5±1.8	10.3±2.0	10.7±1.9	10.3±2.0	11.3±1.3	<b>0.038+</b>
a* right	10.8±1.8	10.5±1.8	10.9±1.3	11.6±1.6	11.0±1.3	11.6±1.4	0.635
b* left	17.3±2.4	17.0±2.1	17.5±2.4	17.5±1.8	18.1±2.8	<b>17.1±2.6*</b>	0.181
b* right	17.1±3.0	18.5±2.9	17.0±1.5	17.1±1.8	18.3±1.9	17.4±2.3	0.187
<b>IPA</b>							
moisture left	35.1±13.3	<b>41.2±15.9*</b>	37.8±6.8	39.8±14.8	40.8±7.7	44.8±7.2	0.914
moisture right	41.1±15.1	41.2±12.5	38.7±9.5	37.3±18.7	48.5±10.0	44.5±12.4	0.739
R2 left	0.7067±0.0339	0.7252±0.03491	0.6463±0.0674	0.6383±0.0410	0.6349±0.0418	0.6323±0.0775	0.318
R2 right	0.6656±0.0561	0.6650±0.0561	0.6019±0.0552	0.5982±0.0448	0.5705±0.0520	0.5368±0.0851	0.714
R7 left	0.3374±0.0535	0.3231±0.0534	0.2317±0.0546	0.2732±0.0458	0.2386±0.0320	<b>0.2874±0.0336*</b>	0.638
R7 right	0.3188±0.0600	0.3100±0.0488	0.2344±0.0450	0.2350±0.0280	0.2310±0.0322	0.3000±0.0533	0.328
TMM left	18.3±3.8	19.8±5.8	21.1±8.8	20.8±7.8	18.9±3.7	19.0±3.5	0.883
TMM right	13.7±3.3	17.3±6.3	18.1±3.0	18.2±7.0	14.4±3.5	18.2±5.4	0.338
<b>Tape stripping</b>							
multi-layer peeling area left	30.0±16.3	25.5±11.9	54.5±14.1	62.8±12.9	44.8±16.3	48.0±18.2	0.182
multi-layer peeling area right	40.7±16.2	50.1±18.7	63.0±12.3	65.3±13.8	64.4±20.4	69.0±13.5	0.538
single-layer peeling area left	70.0±16.3	74.5±11.9	45.5±14.1	37.4±12.9	55.4±16.9	52.0±13.2	0.182
single-layer peeling area right	58.3±16.2	49.3±16.7	37.0±12.3	34.2±13.8	38.7±19.3	31.0±13.5	0.581
carboxyl protein left	3098.3±275.4	3354.5±455.8	2395.3±225.9	3083.1±335.8	2834.9±295.2	2733.3±249.7	0.333
carboxyl protein right	2702.3±375.0	2934.8±297.5	2485.9±256.3	2780.2±333.2*	2608.4±156.1	2847.5±205.4	<b>0.027**</b>

The results before and after the intervention in each group are shown. All numerical values are expressed as mean ± standard deviation.

Only skin viscoelasticity had four decimal places; the other items are with one decimal place.

For all intergroup comparisons, Dunn-Bonferroni test was performed as a post-hoc test after the Kruskal-Wallis test. Wilcoxon's rank sum test was performed for intragroup comparisons.

P-value: comparison of differences in results before and after intervention in each group (Kruskal-Wallis test)

\*: p<0.05, comparison of results before and after the intervention within each group (Wilcoxon's signed rank sum test)

† : F-C, †† : F-A, ††† : A-C

1 4. Discussion

2 This was a detailed comparative study of the difference between  
3 facial care and acupuncture stimulation performed on the face  
4 for the purpose of cosmetics using subjective and objective  
5 indicators.

6 4.1 Characteristics of the research participants

7 The participants of this study were healthy adult women, with  
8 an average age of  $41.6 \pm 9.7$  years. Those in their 30s to 40s,  
9 who were the main participants of this study, overlap with those  
10 who have high needs for facial esthetics and cosmetic  
11 acupuncture<sup>(7)</sup>. Therefore, we believe that we recruited  
12 participants who could easily return to the clinic.

13 4.2 Subjective evaluation

14 A significant decrease in potential privilege awareness in  
15 narcissistic vulnerability was observed in Group F compared  
16 with the other two groups. Narcissistic vulnerability evaluates  
17 the ability of a person to maintain psychological stability, and a  
18 high level indicates a propensity toward social phobia<sup>(8)</sup>.  
19 Entitlement in narcissistic vulnerability requires that a person  
20 receives special treatment or special consideration from other  
21 people. The decrease in this index in Group F improved the  
22 participants' perception of receiving special treatment through  
23 the intervention and shows that the intervention is  
24 psychologically stabilizing, which we believe is the result of  
25 the relaxation effect. Furthermore, other-directedness in self-  
26 monitoring significantly increased in Group C compared with  
27 Group F. Improving other-directedness generally reflects a high  
28 degree of sociality. However, it is unlikely that a significant  
29 improvement would be observed in Group C, as the participants  
30 were followed up for a short period. In contrast, it has been

1 reported in recent years that discomfort, depression, and anger  
2 tend to increase in people who have high other-directedness in a  
3 stressful environment where situations do not go as planned<sup>(9)</sup>.

4 Considering this, the degree of stress worsened in Group C  
5 because life was restricted due to efforts to prevent the spread  
6 of coronavirus disease 2019 (COVID-19). It is possible that this  
7 affected the increased degree of stress. In other words, in  
8 response to these current stresses, it is possible that the  
9 increase in stress was suppressed when the participants in  
10 Groups F and A underwent treatment. Self-monitoring is defined  
11 as “individual differences that monitor and assess whether self-  
12 expression behavior and self-presentation are socially  
13 appropriate using social comparisons as clues.” Therefore, we  
14 believe that one factor for the change in the total score in  
15 Group A is that it was possible for the participants to act  
16 according to the situation based on the intervention. The reason  
17 for this change is unclear. However, in Group A, the  
18 intervention allows for conversations, whereas conversation was  
19 almost impossible in Group F. As such, it is possible that a  
20 long-term intervention facilitated human relationship through  
21 conversations.

22 Conspicuous pores and tightness after face washing decreased  
23 in Group F compared with Group C, and a significant decrease  
24 in skin condition was observed in Group A compared with Group  
25 C. It is probable that the changes in Group F improved in  
26 response to the changes in the objective indicators, which are  
27 described later. The factors that improved the overall results of  
28 the skin condition in Group A are unclear. However, the effects  
29 may have been caused by morphological changes in the face  
30 (e.g., amount of sebum, muscle relaxation, and lift-up due to



1 lymphatic circulation), which were not evaluated and measured  
2 in this study, and the subtle changes that occurred in each  
3 participant were not detected in the objective evaluation of this  
4 study.

5

#### 6 4.3 Objective evaluation

7 No significant differences in cerebral blood flow were observed  
8 in the intergroup or intragroup comparisons. Previous studies  
9 have reported that acupuncture and tactile stimulation increase  
10 cerebral blood flow<sup>(10),(11)</sup>, but this study provided different  
11 results. This study was likely performed in a more stressful  
12 environment such as restrictions in movement due to COVID-19  
13 and compulsory lifestyle changes. In other words, the  
14 participants of the study were exposed to chronic stress<sup>(12)</sup>,  
15 which interferes with brain function<sup>(13)</sup> and causes changes in  
16 cerebral blood flow. On the other hand, the subjective  
17 evaluation showed significant changes in multiple items of the  
18 psychological scale, and it is highly possible that facial care  
19 and acupuncture stimulation have mental and physical effects.

20 In the arousal and mental fatigue tests, no significant  
21 intergroup and intragroup differences were observed. In Group  
22 F, the numerical value tended to increase in the flicker yellow  
23 item compared to that observed in the other groups. The reason  
24 for this is that the skin was touched only during insertion and  
25 acupuncture in Group A, whereas in facial care, the skin is  
26 touched for a long time throughout the procedure. Since tactile  
27 stimulation promotes the secretion of oxytocin<sup>(14)</sup>, one reason  
28 for the increase in the flicker yellow item may be that more  
29 oxytocin was secreted during facial care than during  
30 acupuncture stimulation. Oxytocin has a stress-reducing

1 effect<sup>(14)</sup> and therefore may reduce fatigue and improve  
2 concentration. However, oxytocin was not measured in this  
3 study, which could be a focus for future studies.

4 A decrease in melanin level and an increase in L \* value were  
5 observed in Group F, and a significant difference in the  
6 proportion of carbonylated protein was observed in Group A  
7 compared with the other groups.

8 It is possible that the decrease in melanin and the increase in  
9 L\* value in Group F are due to the decrease in melanin, which  
10 has the potential to produce spots, and the increase in the  
11 translucency and brightness of the skin. Decreased melanin is  
12 said to be a phenomenon caused by the suppression of melanin  
13 production by whitening agents, physical effects such as  
14 friction, and the removal of the old stratum corneum containing  
15 melanin by turnover. However, the cream used in this study did  
16 not contain a whitening agent. Alternatively, facial care may  
17 have physically removed the old stratum corneum or accelerated  
18 turnover. Therefore, decreased carbonylated protein in the  
19 stratum corneum and the exfoliation area of the stratum should  
20 be observed. However, such results were not obtained in this  
21 study. Since the multi-layer exfoliation area in Group F showed  
22 a decreasing trend, it is necessary to increase the number of  
23 research participants to reexamine such effects in the future.

24 One reason for the increase in the proportion of carbonylated  
25 protein in Group A is an increase in blood hemoglobin oxygen  
26 saturation and an increase in oxidative stress<sup>(15)</sup> due to a minute  
27 inflammatory reaction caused by the acupuncture stimulation. It  
28 is possible that acupuncture stimulation performed twice a week  
29 led to a regular increase in active oxygen and increased the  
30 carbonylated protein that causes yellowing. There was an

1 increase in the Hb SO<sub>2</sub> index in Group A, which may be because  
2 acupuncture stimulated axonal reflexes and improved local  
3 peripheral circulation. Previous reports have mentioned that the  
4 axon reflex is a result of the release of neuropeptides such as  
5 calcitonin gene-related peptide and substance P from nerve  
6 endings and the release of nitric oxide from vascular  
7 endothelial cells. Since these are considered to be related to the  
8 improvement of peripheral circulation, the same effect may  
9 have also improved these circulation which accordingly  
10 increased the Hb SO<sub>2</sub> index in this study.

11

#### 12 4.4 Subjective and objective evaluation results

13 This study suggests that both interventions may suppress the  
14 increase in stress and improve the skin condition. In addition,  
15 when comparing the effect of each intervention on the skin  
16 condition, acupuncture caused a change in skin texture,  
17 although it was limited to intra-group comparisons. In the  
18 facial care treatment, changes were observed in items that are  
19 strongly related to the amount of moisture, such as conspicuous  
20 pores, wrinkles, and tightness after face washing. Based on  
21 this, the subjective effects may be different even if individuals  
22 experienced the same improvement in skin condition. The  
23 changes in skin condition in the acupuncture stimulation group  
24 were affected by the sulcus cutis and crista cutis as well as the  
25 texture, which was also affected by multiple factors such as  
26 uneven color, rough skin, and feel. Considering the  
27 comprehensiveness of the evaluations, it is necessary to clarify  
28 the definition of each evaluation item and subsequently conduct  
29 a detailed examination of the changes observed in this study. It  
30 is necessary to examine the load method, measurement timing,

1 and intervention period in more detail in the future.

2 This study also had some limitations. We only evaluated the  
3 immediate effects of the intervention period and did not stratify  
4 the results by age. Despite these limitations, this study is  
5 significant as a first step when considering the selection of  
6 treatment according for facial esthetics.

7

## 8 5. Comparison with previous studies (Table 3)

### 9 5.1 Results from Ichushi search

10 A search on Ichushi-Web using the terms “cosmetic acupuncture  
11 and moxibustion (limited to original studies)” resulted in 22  
12 published studies. Matsuura et al.<sup>(16)</sup> previously reviewed 44  
13 studies, including the 22 we found in Ichushi-Web, in a targeted  
14 search up to December 31, 2020. Thus, to cover the period  
15 between January 1, 2021 and October 13, 2022, we performed  
16 another search with the targeted keyword “cosmetic acupuncture  
17 and moxibustion (limited to original articles).” Our search  
18 resulted in two studies, only one of which performed facial  
19 acupuncture stimulation.

### 20 5.2 Results from PubMed search

21 A search on PubMed using the search term “cosmetic  
22 acupuncture (limited to RCT)” resulted in 13 published studies.  
23 However, these studies used microneedles or focused on  
24 diseases, such as chloasma and eczema infantile, and no studies  
25 examined the cosmetic effects of acupuncture and moxibustion  
26 stimulation.

### 27 5.3 Reviews with literature search

28 Previous studies used subjective evaluations, such as feelings  
29 of dryness and skin satisfaction, and/or objective evaluations,  
30 such as the amount of skin moisture and the amount of water

1 loss. However, these studies had various issues, including half  
2 of them being published without peer review, lack of uniformity  
3 in evaluation methods, and diversity in stimulation sites and  
4 methods. Even a literature search without limiting the types of  
5 study design yielded only 44 studies, and performing a meta-  
6 analysis was considered difficult. Thus, despite some  
7 achievements made as a field of treatment, cosmetic  
8 acupuncture and moxibustion are immature as a field of  
9 research. Therefore, we cannot clearly state that they generally  
10 have a certain effect.

11 Subsequently, we compared the results of this study with those  
12 of peer-reviewed original studies, focusing on the evaluation  
13 methods. One study evaluated the amount of moisture, similar  
14 to our study; however, they did not show the effectiveness. One  
15 study evaluated the amount of water loss, which showed a  
16 significant difference compared with the control group. One  
17 study evaluated the skin tone but did not show the  
18 effectiveness. Two studies evaluated the VAS of the skin  
19 condition, both of which showed the effectiveness. However, no  
20 studies used the evaluation method used in our study. In our  
21 study, no change was observed in the amount of moisture of  
22 water loss or in skin tone; however, the effectiveness of the  
23 VAS for the skin condition was generally seen, similar to  
24 previous studies. Regarding the difference in the amount of  
25 water loss observed between the present and previous studies,  
26 the differences in age groups of study subjects and in  
27 recruitment standards were thought to be major factors. Direct  
28 comparison of the results was difficult because some studies  
29 used different measurement equipment despite using the same  
30 evaluation methods, different measurement environments

1 including an environment with constant temperature and  
 2 humidity, and different timing of implementation including  
 3 different seasons. Therefore, carrying out research activities  
 4 under the guidance and cooperation of experts in the cosmetic  
 5 field is desirable.

6 Consequently, we collaborated with experts who were actually  
 7 working on the development of cosmetics and examined the  
 8 effectiveness of acupuncture stimulation using comprehensive  
 9 subjective and objective evaluations. In addition, the cost-  
 10 effectiveness of cosmetic acupuncture and moxibustion has been  
 11 an issue, and the actual difference between those and other  
 12 cosmetic techniques in various types of evaluation was unclear.  
 13 Despite this aspect, this study compared the effects of  
 14 specialized facial care and cosmetic acupuncture and thus can  
 15 be considered a highly novel study.

Table 3 Results of the literature review

Authors	Title	Subjects	Intervention	Evaluation
Tamaki et al. 2020	Comparison of combined esthetic acupuncture with independent acupuncture in the facial region	44 subjects Non-RCT	① Combined group (facial care+ acupuncture) ② Single group (acupuncture only)	Facial check sheet (FCS)
Tamaki et al. 2019	Effects of combined esthetic treatment and facial acupuncture on facial appearance	11 subjects Before-and-after comparison trial	Combined use of facial care and acupuncture	FCS
Shirai et al. 2018	Examination of facial regions after acupuncture using self-evaluation and evaluation by others	8 subjects Before-and-after comparison trial	Acupuncture treatment	FCS
Yamazaki et al. 2018	The effects of stimulation by acupuncture on facial blood flow	10 subjects Crossover trial	① Facial acupuncture stimulation group ② Upper/lower extremity stimulation group Control group	Facial skin blood flow
Fukuyo et al. 2015	Effect on the skin temperature distribution in the region of face acupuncture	10 subjects RCT	① Acupuncture stimulation group ② Non-stimulation group	Facial skin temperature
Uesaka et al. 2012	The effect of acupuncture alone and combined treatment of acupuncture and aromatherapy on dry skin: stratum corneum hydration and transepidermal water loss evaluation	18 subjects RCT	① Combined group (acupuncture treatment + aromatic bath) ② Acupuncture treatment Control group	1. VAS of the feeling of dryness 2. Level of skin satisfaction 3. STAI 4. Stratum corneum hydration 5. Transepidermal water loss
Sato et al. 2012	Investigation of the beautification effects of acupuncture and acupressure: A subjective and objective evaluation	14 subjects RCT	① Acupuncture group ② Acupressure group	1. Self-rated health 2. VAS of physical and mental fatigue 3. Mood state (Nowlis mood checklist) 4. Questionnaire about skin condition 5. Skin color (L*value, a*value, b*value) 6. Corneocyte surface area 7. Slack 8. Wrinkle-area ratio 9. Impression evaluation from a third party by video

Peer-reviewed original studies performing facial acupuncture stimulation were extracted from "A literature review on cosmetic acupuncture and moxibustion in Japan."

16

## 17 6. Conclusion

18 We performed acupuncture stimulation and facial care on the  
 19 faces of healthy adult women and conducted a comprehensive

1 survey of the effects on the face, mind, and body using  
2 subjective and objective evaluations. Our findings were as  
3 follows:

- 4 1. Group A showed significant changes in the overall score of  
5 self-monitoring, the texture of the skin condition, and the  
6 overall skin condition. Group F showed significant changes in  
7 entitlement in the psychological scale and in conspicuous pores,  
8 wrinkles, tightness after face washing, and the skin condition.
- 9 2. Significant changes were observed in the Hb SO<sub>2</sub> index and  
10 proportion of carbonylated protein in Group A and in the  
11 melanin index, L\* value, and water content in the stratum  
12 corneum in Group F.

13 Based on the above, the cosmetic effect on the mind, body, and  
14 skin condition may differ depending on the intervention used.

15

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19 participants for their cooperation during this study.

20

## 21 8. Conflict of Interest

22 There are no authors with conflicting interests that should be  
23 disclosed in connection with this study.

24

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