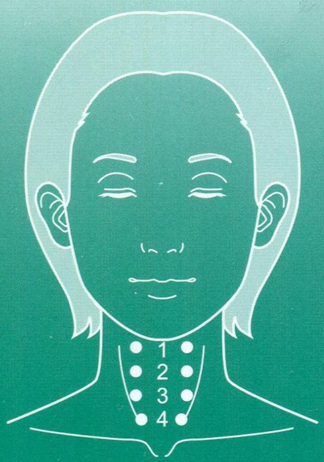
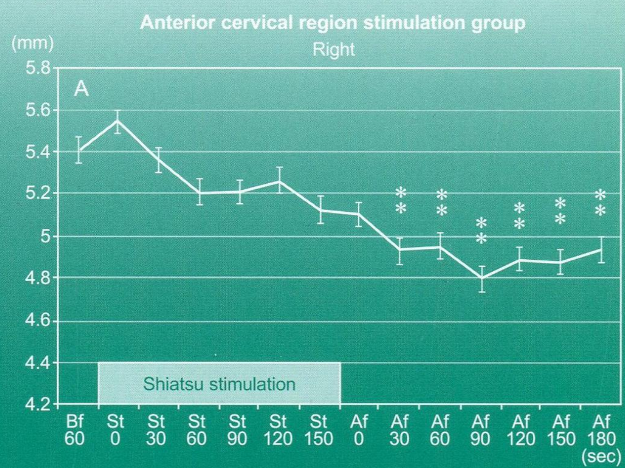
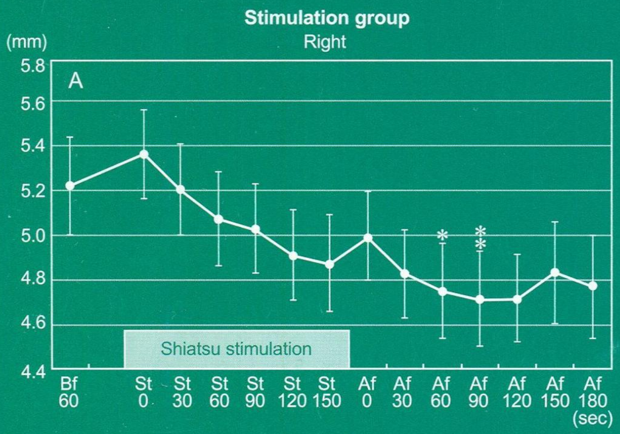
Collected Reports of The Shiatsu Therapy Research Lab

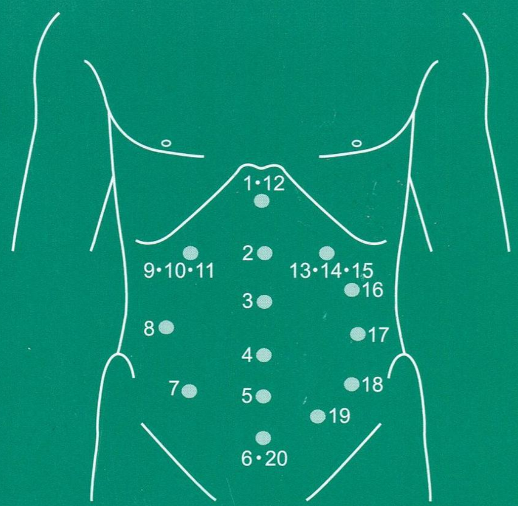
1998–2012

Japan Shiatsu College









Material aportado por la Escuela Japonesa de Shiatsu

Foreword

On Publication of the Collected Reports of the Shiatsu Therapy Research Lab

The first edition of the *Collected Reports of the Shiatsu Therapy Research Lab*, which contained 11 reports, was published five years ago by the Japan Shiatsu College to commemorate the Lab's 10th anniversary. The research studies it presented received high commendation from readers both in Japan and abroad. Now, in this current edition, we have gathered additional reports produced over the following five years and combined them with those of the previous collection, all in one volume, and are making it available for the first time in English.

Despite the wealth of everyday clinical experience shiatsu therapists have accumulated treating disorders such as neuralgia and muscular pain, reducing the pain of childbirth, facilitating the natural passage of ureter stones, and so on, for a long time these successes were not formally presented in the form of scientific research papers. In recent years, however, senior students of our college have been presenting papers at medical-related academic conferences to announce the results of their ongoing clinical studies, thereby contributing greatly to the success of the Shiatsu Therapy Research Lab. Also in recent years, we have received inquiries from shiatsu therapists' associations and government agencies in various Western countries requesting materials that demonstrate a scientific basis for shiatsu. I hope these collected reports will facilitate the process of attaining legal recognition for shiatsu therapy in countries around the world.

In closing, I would like to express my deepest appreciation to Professor Hidetoshi Mori and Associate Professor Hideo Ohsawa of the Tsukuba College of Technology for their supervision and guidance, and to the successive generations of teaching advisors and researchers for their ongoing efforts. I hope they will continue to produce the same good, high quality research in the future as we find within these pages.

March 2013

Hiroshi Ishizuka
Principal, Japan Shiatsu College

It has been 15 years since the Shiatsu Therapy Research Lab was established, and above all we owe a debt of gratitude to the students of the Japan Shiatsu College, whose dedicated efforts over the years have allowed us to continue our research activities. Without their support and the enormous amount of time they invested working together to produce each report, the success of this research program would not have been possible. Editing these reports has been a trip down memory lane for me, as I recall the faces of individual students and the many memorable experiences we shared. I am confident that now, having embarked on their careers as shiatsu therapists working in clinical settings, they have become aware more than ever of the value of the basic research we have done here.

Since our first study conducted in 1998, which confirmed shiatsu's effect on reducing heart rate, we have continued to report on other effects of shiatsu, including lowering blood pressure, increasing muscle blood volume, improving muscle pliability and spinal mobility, stimulating gastric motility, and stimulating the pupil contraction response. This volume presents a clear picture of the path our research has followed to date, with each new study building on the results of past reports.

I would like to express my heartfelt appreciation to the participants in the Shiatsu Therapy Research Lab for all of their efforts since its inception. Each and every one of the reports they have produced has been notable. I would also like to thank professors Mori and Ohsawa for their supervision and guidance. It has been thanks to all of you that we were able to assemble these Collected Reports in our 15th year. I hope that they will be of use to everyone involved in shiatsu therapy.

March 2013

Kazuo Watanabe
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Effect on Spinal Mobility of Shiatsu Stimulation to the Inguinal Region

Japan Shiatsu College
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I. Introduction

The Japan Shiatsu College has previously conducted research into the effects of shiatsu stimulation on heart rate, peripheral circulation (pulse wave height, skin temperature, muscle blood volume), blood pressure, and spinal mobility. We reported responses including reduction in heart rate post-stimulation and reduced pulse wave height values in fingertip pulse wave during stimulation[1]; reduction in blood pressure during and after stimulation[2]; increase in heel pad skin temperature immediately post-stimulation[3]; and increased skin temperature accompanied by decreased muscle blood volume and decreased skin temperature accompanied by increased muscle blood volume immediately post-stimulation[4]. Concerning spinal flexibility, finger-floor distance (FFD) improved due to shiatsu stimulation of the dorsal region[5], as did standing forward flexion due to shiatsu stimulation of the abdominal and inguinal regions[6]. We were thus able to confirm shiatsu stimulation's action on the circulatory system and its effect on standing forward flexion.

The spine is freely mobile, capable of anteflexion, dorsiflexion, left and right lateral flexion, and left and right rotation. It is understood that, while individual intervertebral range of motion (ROM) is slight, the articulation of the spine's interrelated joints creates significant range of motion overall[6]. We have shown that, by using shiatsu stimulation to reduce muscular tension in the muscles that support and reinforce those joints in the dorsal and ventral regions, spinal range of motion is increased[5,6,8,9].

In this study, to further investigate spinal mobility, we applied shiatsu stimulation to the inguinal region, through which pass the iliacus and psoas major muscles, referred to collectively as the iliopsoas, a postural support muscle. The objective of this research was to study the effect of stimulation of the inguinal region on spinal mobility relating to spinal ROM in anteflexion and dorsiflexion.

II. Methods

1. Subjects

Research was conducted on 30 healthy adult students of the Japan Shiatsu College (18 males, 12 females) aged 18–67 years old (average age: 39.5 ± 14.1 years old).

2. Test period

April 1 to September 20, 2008, on Saturdays between 1:30PM and 6PM

3. Test location

Testing was conducted in the 5th-floor shiatsu training hall at the Japan Shiatsu College. Room temperature was 25.0 ± 2°C and humidity was 63.0 ± 12.0%.

4. Measurement procedures and devices used

Spinal mobility was measured using a Spinal Mouse® (Index Co., Ltd.). This device enabled measurement of angle and range of motion of each intervertebral space on both the sagittal and coronal planes from the body surface (Fig. 1).

In this test, to assess spinal ROM on the sagittal plane, we investigated anteflexion ROM and dorsiflexion ROM using angles at various locations (spinal inclination angle, thoracic kyphotic angle, lumbar lordotic angle, sacral/pelvic inclination angle), as measured in standing neutral (posture while standing), maximum anteflexion (posture of maximum anteflexion from standing), and maximum dorsiflexion (posture of maximum dorsiflexion from standing) positions. Anteflexion ROM is the difference between measurement values in the standing neutral and maximum anteflexion positions, and dorsiflexion ROM is the difference between measurement values in the standing

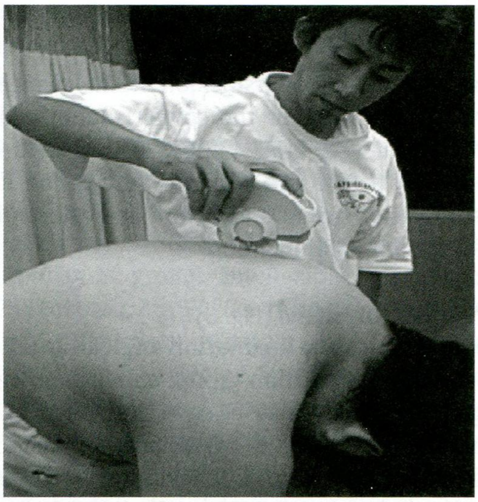
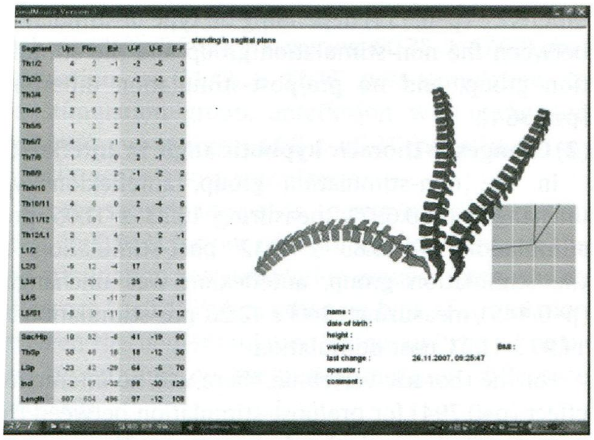


Fig. 1. Measurement using Spinal Mouse®



ig. 2. Spinal ROM measurement screen

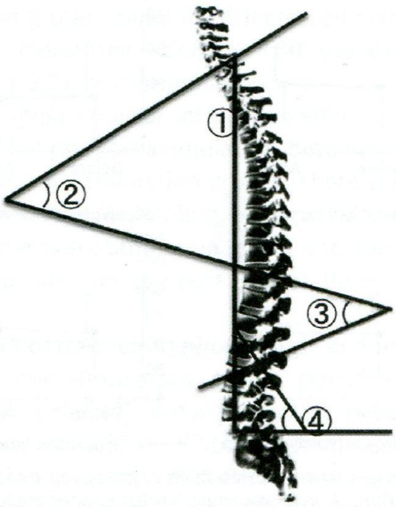


Fig. 3. Measurement items: angle of curvature of spine and individual locations.

neutral and maximum dorsiflexion positions (Fig. 2).

Measurement involved taking the segmental angle, consisting of the angle between a line joining the superior and inferior spinous processes and a vertical line, inputting the data recorded using the Spinal Mouse® into a computer, and abstracting the anteflexion and dorsiflexion of the sagittal curve.

Measurement items are shown below (Fig. 3).

① Spinal inclination angle (SIA): Indicates the measure of overall ROM using a straight line between the 1st thoracic vertebra and the 1st sacral vertebra. Expressed as the angle between that line and a vertical line.

② Thoracic kyphotic angle (TKA): Indicates the curvature from the 1st to the 12th thoracic vertebrae, or the overall thoracic curve.

③ Lumbar lordotic angle (LLA): Indicates the curvature from the 1st to the 5th lumbar vertebrae, or the overall lumbar curve.

④ Sacral/pelvic inclination angle (SIA): The sacral inclination angle is the angle measured, but because the sacrum is joined to the pelvis via the sacroiliac joints, it corresponds to the pelvic inclination angle.

5. Shiatsu stimulation (Fig. 4)

Palm pressure was applied for 5 seconds per point to each of the 3 basic Namikoshi shiatsu points in the inguinal region (following the inguinal ligament, Point 1: medioinferior to the anterior superior iliac spine; Point 2: over the arterial pulse; Point 3: superolateral to the pubic bone), bilaterally for 5 minutes per side, for a total of 10 minutes. All shiatsu stimulation was applied using standard pressure application methods (pressure gradually increased, sustained, and gradually decreased), and the amount of pressure used in stimulation was classified as standard pressure (pressure regulated so as to be pleasurable for the test subject)[10].

Because the use of palm pressure is a basic procedure in shiatsu, it was categorized as shiatsu ("finger pressure") for the purpose of this study.

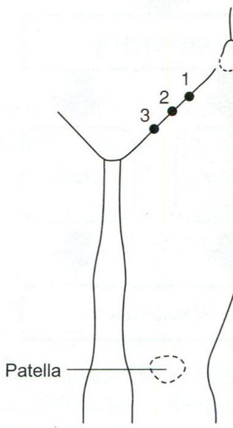


Fig. 4. Area of stimulation

6. Test procedure (Fig. 5)

Test procedures were fully explained to each test subject and their consent obtained. They were also questioned on subjective symptoms such as lumbar pain as well as regular exercise habits.

Two tests were performed, one in which shiatsu stimulation was not applied (hereafter, the non-stimulation group) and one on which shiatsu stimulation was applied (hereafter, the stimulation group). Both tests were applied to all 30 test subjects on different days.

(1) Non-stimulation group

15 minutes rest → measurement → 10 minutes rest → measurement

(2) Stimulation group

15 minutes rest → measurement → 10 minutes shiatsu stimulation → measurement

Rest and stimulation were carried out in the supine position; measurement was carried out in the standing position.

7. Analysis

In analysis of inter-group pre/post-stimulation data between the non-stimulation and stimulation groups, each angle measured (spinal inclination angle, thoracic kyphotic angle, lumbar lordotic angle, and sacral/pelvic inclination angle) was analyzed using Bonferroni multiple comparison and two-way analysis of variance using a general linear model. In analysis of pre/post-stimulation data for the non-stimulation and stimulation groups, each angle measured was analyzed using Bonferroni multiple comparison and one-way analysis of variance. Analytical software used was SPSS Ver.15, with a significance level of ≤5% taken as significant.

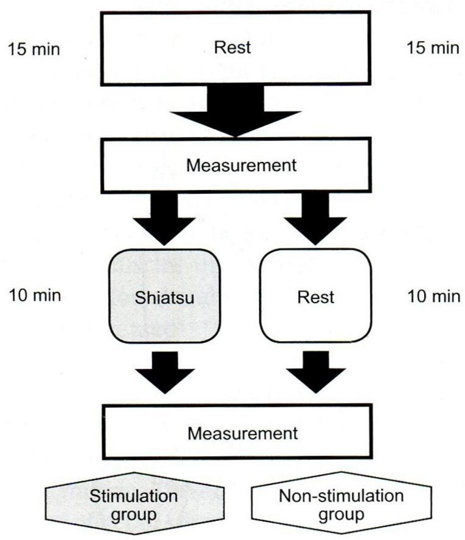


Fig. 5. Test procedure

III. Results

For anteflexion and dorsiflexion ROM, changes are shown (mean ± SD) for the spinal column and each area (thoracic vertebrae, lumbar vertebrae, and sacrum/pelvis) before and after the rest period for the non-stimulation group and before and after stimulation for the stimulation group.

1. Anteflexion ROM (Fig. 6)

(1) Changes to spinal inclination angle in anteflexion

In the non-stimulation group, anteflexion was unchanged (p=0.592), measuring 113.97 ± 13.87° pre-stimulation vs. 114.17 ± 14.61° post-stimulation. In the stimulation group, anteflexion was unchanged (p=0.439), measuring 113.83 ± 13.14° pre-stimulation vs. 114.70 ± 13.85° post-stimulation.

For the spinal column, there was no interaction effect (p=0.57) for pre/post-stimulation between the non-stimulation and stimulation groups. There was no difference (p=0.955) depending on type of stimulation between the non-stimulation group and the stimulation group, and no pre/post-stimulation difference (p=0.364).

(2) Changes to thoracic kyphotic angle in anteflexion

In the non-stimulation group, anteflexion was unchanged (p=0.697), measuring 16.33 ± 11.05° pre-stimulation vs. 15.83 ± 11.12° post-stimulation. In the stimulation group, anteflexion was unchanged (p=0.445), measuring 15.93 ± 12.26° pre-stimulation vs. 14.97 ± 11.23° post-stimulation.

For the thoracic vertebrae, there was no interaction effect (p=0.794) for pre/post-stimulation between the non-stimulation and stimulation groups. There was no

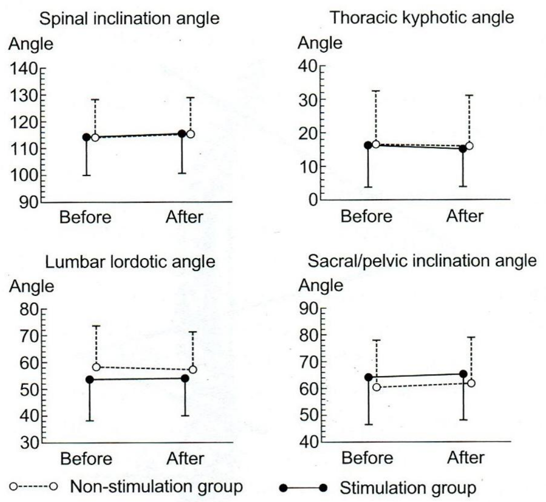


Fig. 6. Changes to anteflexion ROM as measured by spinal inclination angle, thoracic kyphotic angle, lumbar lordotic angle, and sacral/pelvic inclination angle, resulting from non-stimulation and shiatsu stimulation

difference (p=0.823) depending on type of stimulation between the non-stimulation group and the stimulation group, and no pre/post-stimulation difference (p=0.413).

(3) Changes to lumbar lordotic angle in anteflexion

In the non-stimulation group, anteflexion was unchanged (p=0.207), measuring 58.57 ± 15.25° pre-stimulation vs. 57.10 ± 13.94° post-stimulation. In the stimulation group, anteflexion was unchanged (p=0.798), measuring 53.70 ± 14.01° pre-stimulation vs. 54.03 ± 15.03° post-stimulation.

For the lumbar vertebrae, there was no interaction effect (p=0.299) for pre/post-stimulation between the non-stimulation and stimulation groups. There was no difference (p=0.283) depending on type of stimulation between the non-stimulation group and the stimulation group, and no pre/post-stimulation difference (p=0.512).

(4) Changes to sacral/pelvic inclination angle in anteflexion

In the non-stimulation group, anteflexion was unchanged (p=0.209), measuring 60.33 ± 17.68° pre-stimulation vs. 61.43 ± 17.26° post-stimulation. In the stimulation group, anteflexion was unchanged (p=0.585), measuring 64.00 ± 16.31° pre-stimulation vs. 64.90 ± 17.57° post-stimulation.

For the sacrum and pelvis, there was no interaction effect (p=0.914) for pre/post-stimulation between the non-stimulation and stimulation groups. There was no difference (p=0.415) depending on type of stimulation between the non-stimulation group and the stimulation group, and no pre/post-stimulation difference (p=0.282).

2. Dorsiflexion ROM (Fig. 7)

(1) Changes to spinal inclination angle in dorsiflexion

In the non-stimulation group, spinal ROM decreased significantly (p=0.046), measuring −34.47 ± 8.66° pre-stimulation vs. −32.53 ± 9.87° post-stimulation. In the stimulation group, spinal ROM increased significantly (p=0.008), measuring −32.87 ± 8.60° pre-stimulation vs. −35.37 ± 9.73° post-stimulation.

For the spinal column, interaction effect was shown (p=0.001) for pre/post-stimulation between the non-stimulation and stimulation groups. There was no difference (p=0.789) depending on type of stimulation between the non-stimulation group and the stimulation group, and no pre/post stimulation difference (p=0.659).

(2) Changes to thoracic kyphotic angle in dorsiflexion

In the non-stimulation group, dorsiflexion was unchanged (p=0.844), measuring 3.63 ± 11.48° pre-stimulation vs. 3.97 ± 12.69° post-stimulation. In the stimulation group, dorsiflexion was unchanged (p=0.947), measuring 2.10 ± 13.50° pre-stimulation vs. 2.20 ± 15.23° post-stimulation.

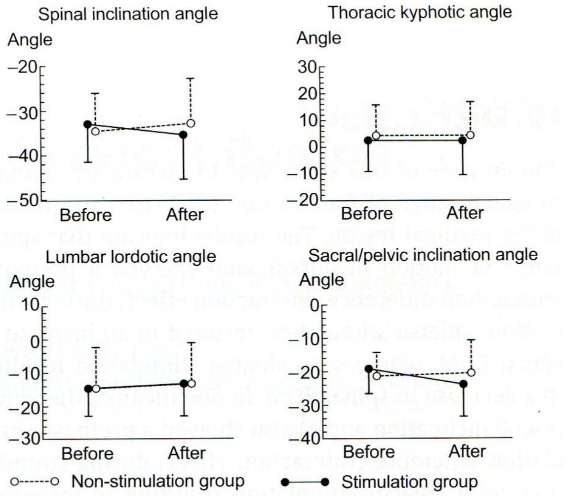


Fig. 7. Changes to dorsiflexion ROM as measured by spinal inclination angle, thoracic kyphotic angle, lumbar lordotic angle, and sacral/pelvic inclination angle, resulting from non-stimulation and shiatsu stimulation

For the thoracic vertebrae, there was no interaction effect (p=0.917) for pre/post-stimulation between the non-stimulation and stimulation groups. There was no difference (p=0.613) depending on type of stimulation between the non-stimulation group and the stimulation group, and no pre/post-stimulation difference (p=0.847).

(3) Changes to lumbar lordotic angle in dorsiflexion

In the non-stimulation group, dorsiflexion was unchanged (p=0.461), measuring −14.40 ± 6.99° pre-stimulation vs. −13.27 ± 12.11° post-stimulation. In the stimulation group, dorsiflexion was unchanged (p=0.292), measuring −14.67 ± 8.30° pre-stimulation vs. −13.17 ± 9.52° post-stimulation.

For the lumbar vertebrae, there was no interaction effect (p=0.859) for pre/post-stimulation between the non-stimulation and stimulation groups. There was no difference (p=0.974) depending on type of stimulation between the non-stimulation group and the stimulation group, and no pre/post-stimulation difference (p=0.207).

(4) Changes to sacral/pelvic inclination angle in dorsiflexion

In the non-stimulation group, dorsiflexion was unchanged (p=0.594), measuring −21.13 ± 6.99° pre-stimulation vs. −20.40 ± 9.62° post-stimulation. In the stimulation group, dorsiflexion increased (p=0.006), measuring −19.27 ± 7.66° pre-stimulation vs. −23.70 ± 11.55° post-stimulation.

For the sacral/pelvic angle, interaction effect was shown (p=0.014) for pre/post-stimulation between the non-stimulation and stimulation groups. There was no difference (p=0.737) depending on type of stimulation between the non-stimulation group and the stimulation group, and a trend toward pre/post stimulation difference (p=0.074).

IV. Discussion

The purpose of this study was to investigate changes to spinal range of motion due to shiatsu stimulation of the inguinal region. The results indicate that spinal range of motion in dorsiflexion showed a pre/post-stimulation difference (interaction effect) during stimulation: shiatsu stimulation resulted in an increase in spinal ROM, whereas no shiatsu stimulation resulted in a decrease in spinal ROM. In dorsiflexion, the pelvis (sacral inclination angle) also showed a pre/post-stimulation difference (interaction effect) during stimulation, with shiatsu stimulation resulting in increased pelvic ROM and no shiatsu stimulation resulting in no change to pelvic ROM.

Joints in the thoracic spine, lumbar spine, and pelvis are all involved in spinal ROM, and it has been shown that a flexible person can attain a maximum of 250° cumulative ROM in these joints between anteflexion and dorsiflexion[7].

Houki et al[11] analyzed the postures of 168 subjects between the ages of 19 and 65 using a Spinal Mouse®. In anteflexion, males achieved 89.9 ± 15.1° and females 85.3 ± 21.7°, and in dorsiflexion, males achieved –29.8 ± 11.3° and females –22.0 ± 11.1°.

Hakuta et al[12] analyzed the standing postures of 89 subjects between the ages of 18 and 28 using a Spinal Mouse®. In anteflexion, males achieved 97.1 ± 16.0° and females 96.1 ± 18.2°, and in dorsiflexion, males achieved –40.1 ± 12.8° and females –38.0 ± 9.0°.

In this study, pre-stimulation anteflexion figures were 113.97 ± 13.87° for the non-stimulation group and 113.83 ± 13.14° for the stimulation group, while pre-stimulation dorsiflexion figures were –34.47 ± 8.66° for the non-stimulation group and –32.87 ± 8.60° for the stimulation group. This indicates that spinal ROM was greater for subjects in this study than in previous studies by Houki et al and Hakuta et al. Spinal ROM in dorsiflexion was analogous to that seen in previous studies by Houki et al and Hakuta et al.

In the inguinal region, which was the area subject to shiatsu stimulation in this study, the psoas major originates on the lumbar transverse processes and the iliacus originates on the ilium, both inserting on the lesser trochanter of the femur. The action of the iliopsoas is to flex the hip joint (anteflexion), but it is likely that the relaxation of tonus in this pair of muscles can also affect dorsiflexion. From this, we surmise that shiatsu stimulation of the inguinal region caused increased pelvic ROM, which was accompanied by increased spinal dorsiflexion ROM.

We have previously reported that shiatsu stimulation of the lumbodorsal region, posterior lower limb, abdomen, and inguinal regions result in increased (improved) spinal ROM in anteflexion (FFD, or finger-floor distance)[5,6,8,9]. In this study involving shiatsu stimulation to the inguinal region, it was thought that not including shiatsu stimulation to the lumbodorsal region and posterior lower limb was a factor in the results obtained for ROM in anteflexion. It was also suggested that the relaxation of tonus in erector spinae and posterior lower limb muscles have an important effect on anteflexion ROM. One more factor to take into consideration was that spinal ROM in anteflexion was greater in this study (pre-stimulation) than ROM in anteflexion measured in previous studies.

V. Conclusions

In this study involving 30 healthy adults, the following results were obtained through measurement of anteflexion and dorsiflexion of the spine and its various segments using a Spinal Mouse®.

Shiatsu stimulation of the inguinal region caused increased pelvic ROM, which was accompanied by increased spinal dorsiflexion ROM.

In closing, we would like to express our appreciation to the instructors and students of the Japan Shiatsu College who participated in this research.

References

1 Koyata S et al: Shiatsu shigeki ni yoru shinjunkankei ni oyobosu koka ni tsuite. Toyo ryoho gakko kyokai gakkaishi 22: 40-45, 1998 (in Japanese)
2 Ide Y et al: Ketsuatsu ni oyobosu shiatsu shigeki no koka. Toyo ryoho gakko kyokai gakkaishi 23: 77-82, 1999 (in Japanese)
3 Tsukiashi H et al: Yohaibu no shiatsu shigeki ni yoru kataibu•sokubu hifuon no henka. Toyo ryoho gakko kyokai gakkaishi 31: 133-137, 2007 (in Japanese)
4 Kamohara H et al: Massho junkan ni oyobosu shiatsu shigeki no koka. Toyo ryoho gakko kyokai gakkaishi 24: 51-56, 2000 (in Japanese)
5 Eto T et al: Shiatsu shigeki ni yoru kin no junansei ni taisuru koka (dai 3 ho). Toyo ryohogakko kyokai gakkaishi 27: 97-100, 2003 (in Japanese)
6 Miyachi M et al: Fukubu shiatsu shigeki ni yoru sekichu no kadosei ni taisuru koka. Toyo ryoho gakko kyokai gakkaishi 29: 60-64, 2005 (in Japanese)
7 Hagishima H (tr. supervisor), Shimada T (tr.); I. A. Kapandji : Kapandi kansetsu no seirigaku Taikan · sekichu. Ishiyaku Publishers, Inc.: 38-39, Tokyo, 1995 (in Japanese)
8 Asai S et al: Shiatsu shigeki ni yoru kin no junansei ni taisuru koka. Toyo ryoho gakko kyokai gakkaishi 25: 125-129, 2001 (in Japanese)
9 Tazuke et al: Shiatsu shigeki ni yoru sekichu no kadosei oyobi kin no katasa ni taisuru koka. Toyo ryoho gakko kyokai gakkaishi 28: 29-32, 2004 (in Japanese)
10 Ishizuka H et al: Shiatsu ryohogaku: 40-102, International Medical Publishers, Ltd. Tokyo, 2008 (in Japanese)
11 Houki N et al: Spinal Mouse ni yoru nihonjin kenjoseijin no shiesi bunseki. Higashi nihon seikei saigai geka gakkai zasshi 16 (2): 293-297, 2004 (in Japanese)
12 Hakuta R et al: Spinal Mouse wo mochiita seinenki no ritsui shisei no hyoka. Yamanashi daigaku kango gakkaishi 5 (2): 13-18, 2007 (in Japanese)

Effect on Autonomic Nervous Function of Shiatsu Stimulation to the Anterior Cervical Region

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Hideo Ohsawa (Tsukuba University of Technology), Hidetoshi Mori (Tsukuba University of Technology)

I. Introduction

The Japan Shiatsu College has previously reported in issues 22–31 of the Journal of the Japan College Association of Oriental Medicine on the effects of shiatsu stimulation on the circulatory system (reduction in heart rate and blood pressure, peripheral increase in muscle blood volume, and rise in skin temperature)[1–3]; the musculoskeletal system (improvements in muscle pliability and spinal range of motion)[4–8]; and the digestive system (gastrointestinal motility)[9–10].

Sato et al[9] and Kurosawa et al[10] reported that shiatsu stimulation to the lower leg and to the abdominal region promote gastrointestinal motility. Based on those results, in this study we will investigate what effect shiatsu stimulation to the anterior cervical region has on gastrointestinal motility and on the circulatory system.

II. Methods

1. Subjects

Research was conducted on 21 healthy adult students from this college, including 12 males and 9 females (average age: 38.8 years old). Test procedures were fully explained to each test subject and their consent obtained. They were also asked to refrain from receiving shiatsu or other stimulation on the day of testing.

2. Test period

May 24 to August 20, 2008

3. Test location

Testing was conducted in the basic medicine research lab at the Japan Shiatsu College. Room temperature was 25.0 ± 2.0℃ and humidity was 63.0 ± 12.0%.

4. Outcome measures

(1) Blood pressure

A continuous blood pressure manometer (Japan Colin Jentow-7700) was used to derive blood pressure from the right radial artery using tonometry.

(2) Heart rate

A pulse tachometer (Nihon Kohden Corp. model AT-601G) was used to calculate the momentary heart rate (hereafter, 'heart rate') as triggered by the ECG's R wave (the second deflection on the ECG).

(3) Dominant power (DP)

DP is an indicator of the size of electrical response activity (ERA) in gastric smooth muscle cells accompanying peristalsis. Raw data measured using the electrogastrograph (NIPRO) is subject to spectral analysis using MBFA and classified as slow-wave (0–2 cpm), normal-wave (2–4 cpm), and fast-wave (4–9 cpm), to express changes in the electric potentials of their respective frequency bands.

(4) Frequency

The frequency is the highest amplitude taken from the 0–9 cpm waveforms each minute.

The measurement electrodes for the electrogastrograph were applied to the following areas (Fig. 1).

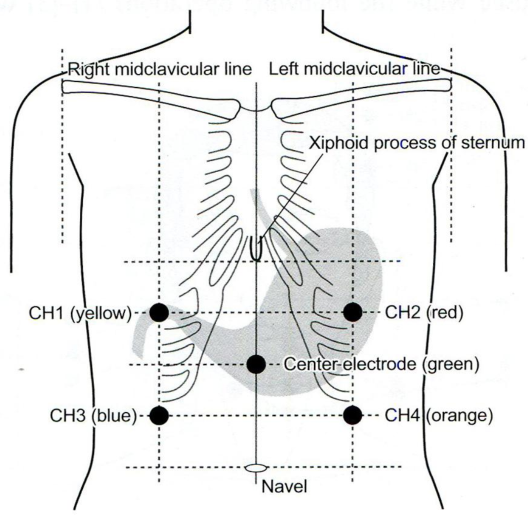

Fig. 1. Electrode positioning

CH1: at the intersection of a line running horizontally through the point midway between the xiphoid process of the sternum and the center electrode and the right midclavicular line

CH2: at the intersection of a line running horizontally through the point midway between the xiphoid process of the sternum and the center electrode and the left midclavicular line

CH3: at the intersection of a line running horizontally through the point midway between the center electrode and the navel and the right midclavicular line

CH4: at the intersection of a line running horizontally through the point midway between the center electrode and the navel and the left midclavicular line

Center electrode: midway between the xiphoid process of the sternum and the navel

5. Stimulation

With the therapist positioned behind the test subject's head, standard pressure was applied using the left thumb, 3 seconds per application for 5 minutes, to a single point on the medial border of the sternocleidomastoid muscle near the area over the carotid artery in the carotid triangle (Fig. 2).

Pressure was regulated so as to be pleasurable for the test subject (standard pressure).

6. Test procedure

The overall condition of the test subjects was determined by asking them to fill out a survey including questions on physical condition, meal times, and usual abdominal condition. After measurement was completed, test subjects completed a survey to determine their feelings on the experimental environment, amount of shiatsu pressure, and changes in abdominal condition due to treatment.

(1) Measurement procedure

Measurements were taken for the 35 minutes that elapsed while the following operations [1]–[3] were performed:

[1] 15 minutes rest (supine position)
[2] 5 minutes treatment
[3] 15 minutes rest (supine position)

(2) Test precautions

The following items were monitored and recorded during testing:

[1] that they remained alert
[2] that they remained motionless
[3] that the surroundings were quiet

(3) Other

Regarding test subjects' meals on the day of testing, no limitations on meal times were established.

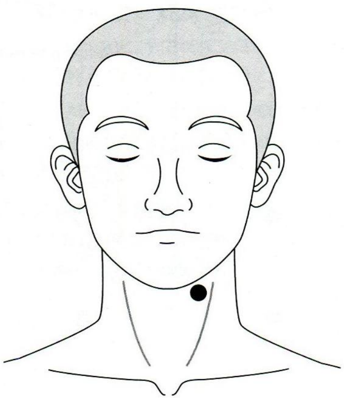

Fig. 2. Point 1, left anterior cervical region

7. Data analysis

(1) Chronological changes to blood pressure and heart rate

Taking the average value during 1 minute prior to stimulation as the control value (cont.), comparisons were made at 1 minute (St.1), 2 minutes (St.2), 3 minutes (St.3), 4 minutes (St.4), and 5 minutes (St.5) during stimulation, and for 1 minute (Af.1), 3 minutes (Af.3), 5 minutes (Af.5), 10 minutes (Af.10), and 15 minutes (Af.15), after stimulation.

(2) Chronological changes to DP and frequency

Taking the average value during 5 minutes prior to stimulation as the control value (cont.), comparisons were made with the average values during stimulation (St.0-5), immediately after stimulation (Af.0-5), 5 minutes after stimulation (Af.6-10), and 10 minutes after stimulation (Af.11-15).

8. Statistical processing

Chronological changes to blood pressure, heart rate, and electrogastrograph were analyzed using Bonferroni multiple comparison and one-way analysis of variance using a general linear model. Analytical software used was SPSS Ver.15, with a significance level of ≤5% taken as significant.

III. Results

During testing there were no instances requiring cessation of treatment due to pain or discomfort.

1. Changes to blood pressure

(1) Maximum blood pressure

Maximum blood pressure decreased significantly (p=0.003) 2 minutes after commencement of stimulation (Fig. 3).

(2) Minimum blood pressure

Minimum blood pressure decreased significantly 1 minute (p=0.022) and 2 minutes (p=0.017) after commencement of stimulation, with a trend toward lower blood pressure (p=0.06) indicated during the 5 minutes of stimulation (Fig. 4).

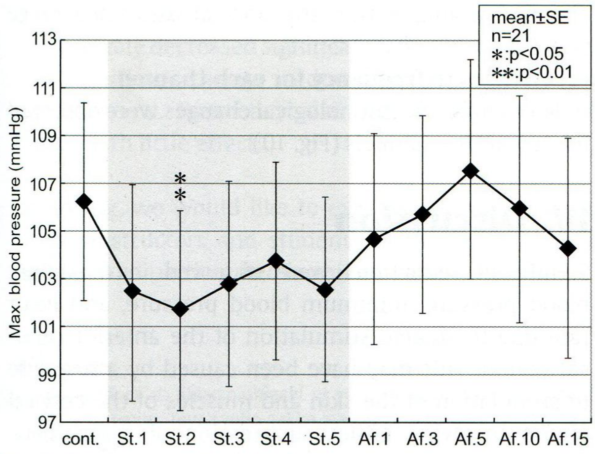

Fig. 3. Changes to maximum blood pressure

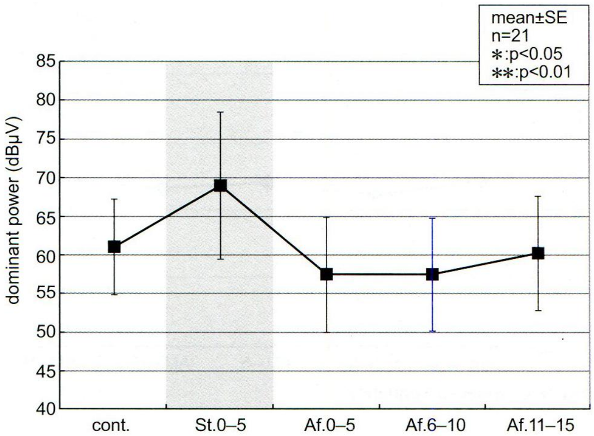

Fig. 6. Changes to DP

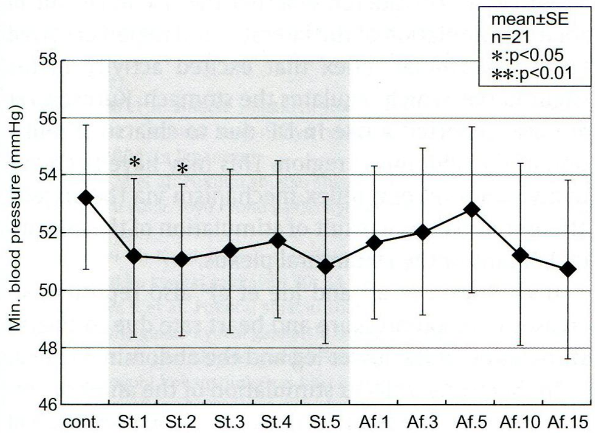

Fig. 4. Changes to minimum blood pressure

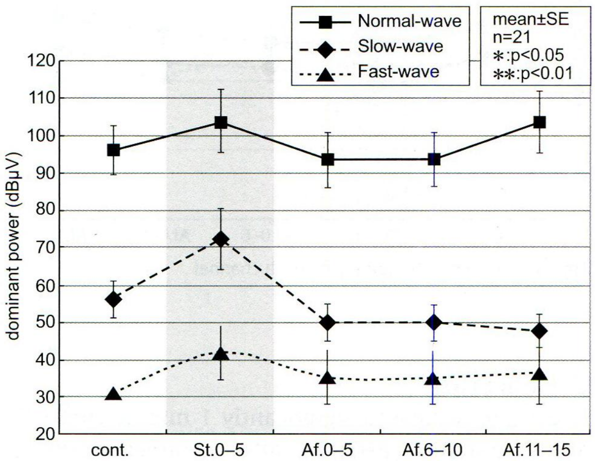

Fig. 7. Changes to DP for each frequency range

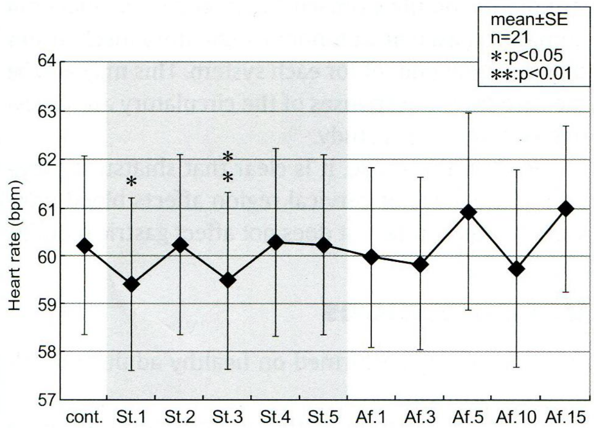

Fig. 5. Changes to heart rate

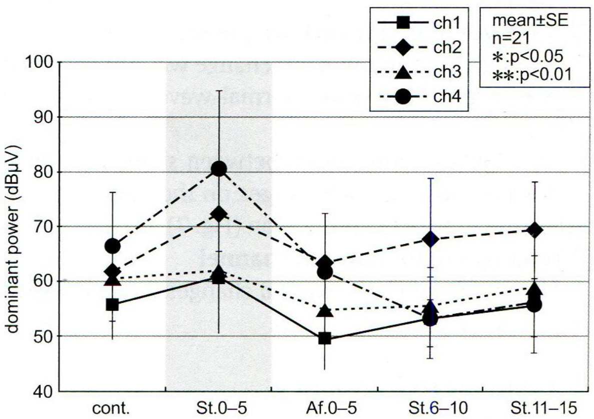

Fig. 8. Changes to DP for each channel

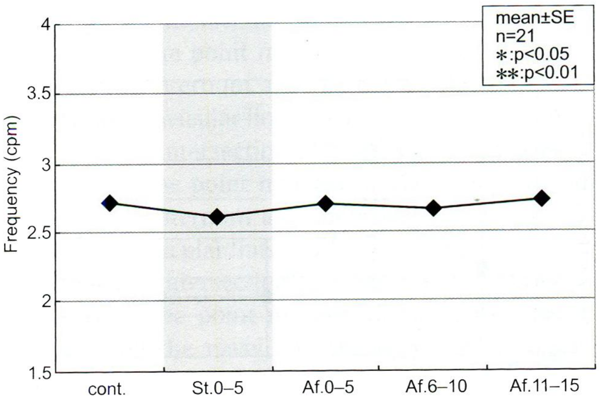

Fig. 9. Changes to frequency

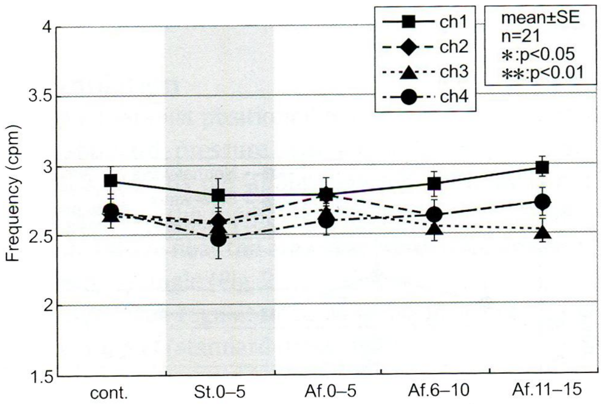

Fig. 10. Changes to frequency for each channel

2. Heart rate

Heart rate decreased significantly 1 minute (p=0.013) and 3 minutes (p=0.001) after commencement of stimulation, and showed a trend toward reduction (p=0.094) during 4 minutes of stimulation (Fig. 5).

3. Changes to DP

(1) DP

A significant chronological change to DP was not observed (Fig. 6).

(2) Changes to DP for each frequency range

A significant chronological change was not observed in any of the slow-wave, normal-wave, or fast-wave ranges.

There was no interaction between slow-wave, normal-wave, and fast-wave ranges on the electrogastrogram due to shiatsu stimulation (Fig. 7).

(3) Changes to DP for each channel

No significant chronological changes were observed in any of the channels (Fig. 8).

4. Changes to frequency

(1) Frequency

Frequency did not exhibit a significant, chronological change, varying within the normal frequency rang (Fig. 9).

(2) Changes to frequency for each channel

No significant, chronological changes were observe for any of the channels (Fig. 10).

IV. Discussion

Significant reductions were observed in maximui blood pressure, minimum blood pressure, and hea rate due to shiatsu stimulation of the anterior cerv cal region. This may have been caused by a respon: to stimulation of the skin and muscles of the cervic region involving either suppression of sympathet nervous function or excitation of parasympathetic ne vous function regulating the heart, or involving su pression of sympathetic nervous function regulatir vascular function. It may also have been caused by depressor response involving a pressoreceptor refl due to pressure applied to the carotid sinus. This resu is the same as reported by Koyata et al[1] and Ide et al[2]

Sato et al[9] considered whether the rise in DP due shiatsu stimulation of the lateral crural region occurr via a supraspinal reflex that excited activity in tl vagus nerve, which regulates the stomach. Kurosawa al[10] also reported a rise in DP due to shiatsu stimul tion of the abdominal region. This may have been d to a viscero-visceral reflex mechanism via the viscei afferent nerves as a result of stimulation of the abdor inal organs or the intramural plexus.

Both Koyata et al[1] and Ide et al[2] also reported d creases in blood pressure and heart rate due to shiat stimulation of the lower leg and the abdominal regic

In this study, shiatsu stimulation of the anterior ce vical region resulted in decreases in blood pressure a heart rate, but an increase in DP was not confirme making it clear that the reaction to shiatsu stimulati with respect to DP differs between stimulation of t anterior cervical region and stimulation of the low leg and abdominal regions.

Imai et al[11] suggested that the effect of acupunctu stimulation on the stomach, heart, and sweat glands humans is based on autonomic regulatory mechanisı that are independent for each system. This may also the case for the responses of the circulatory and dig tive systems in this study.

Based on the above, it is clear that shiatsu stimu tion of the anterior cervical region affects blood pr sure and heart rate, but does not affect gastric motili

V. Conclusions

From this study performed on healthy adults, the f lowing is evident:

1. Shiatsu stimulation of the anterior cervical reg resulted in significant reduction of blood pressı

during stimulation.
2. Heart rate decreased significantly during stimulation.
3. A significant change in dominant power (DP) was not observed. Frequency also varied within normal range, with little effect.

In closing, we would like to express our appreciation to the instructors and students of the Japan Shiatsu College who participated in this research.

References

1 Koyata S et al: Shiatsu shigeki ni yoru shinjunkankei ni oyobosu koka ni tsuite. Toyo ryoho gakko kyokai gakkaishi 22: 40-45, 1998 (in Japanese)
2 Ide Y et al: Ketsuatsu ni oyobosu shiatsu shigeki no koka. Toyo ryoho gakko kyokai gakkaishi 23: 77-82, 1999 (in Japanese)
3 Kamohara H et al: Massho junkan ni oyobosu shiatsu shigeki no koka. Toyo ryoho gakko kyokai gakkaishi 24: 51-56, 2000 (in Japanese)
4 Asai S et al: Shiatsu shigeki ni yoru kin no junansei ni taisuru koka. Toyo ryoho gakko kyokai gakkaishi 25: 125-129, 2001 (in Japanese)
5 Sugata N et al: Shiatsu shigeki ni yoru kin no junansei ni taisuru koka (dai 2 ho). Toyo ryoho gakko kyokai gakkaishi 26: 35-39, 2002 (in Japanese)
6 Eto T et al: Shiatsu shigeki ni yoru kin no junansei ni taisuru koka (dai 3 ho). Toyo ryoho gakko kyokai gakkaishi 27: 97-100, 2003 (in Japanese)
7 Tazuke M et al: Shiatsu shigeki ni yoru sekichu no kadosei oyobi kin no katasa ni taisuru kouka. Toyo ryoho gakko kyokai gakkaishi 28: 29-32, 2004 (in Japanese)
8 Miyachi M et al: Fukubu shiatsu shigeki ni yoru sekichu no kadosei ni taisuru koka. Toyo ryoho gakko kyokai gakkaishi 29: 60-64, 2005 (in Japanese)
9 Sato K et al: Katai shiatsu shigeki ni yoru idenzu no henka. Toyo ryoho gakko kyokai gakkaishi 30: 34-38, 2006 (in Japanese)
10 Kurosawa K et al: Fukubu shiatsu shigeki ni yoru idenzu no henka. Toyo ryoho gakko kyokai gakkaishi 31: 55-58, 2007 (in Japanese)
11 Imai K et al: Hari shigeki ga hikiokosu hito no idenzu, shunji shinpakusu oyobi kokanshinkeisei hifu hanno no henka to sono kijo ni kansuru kenkyu. Meiji shinkyu igaku 19: 45-55, 1996 (in Japanese)

Effect on Pelvic Angle of Shiatsu Stimulation to the Gluteal Region

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I. Introduction

The Japan Shiatsu College has previously conducted research into the effects of shiatsu stimulation on heart rate, peripheral circulation (pulse wave height, skin temperature, muscle blood volume), blood pressure, and spinal mobility. We reported responses including reduction in heart rate post-stimulation and reduced pulse wave height values in fingertip pulse wave during stimulation[1]; reduction in blood pressure during and after stimulation[2]; increase in heel pad skin temperature post-stimulation[3]; and increased skin temperature accompanied by decreased muscle blood volume and decreased skin temperature accompanied by increased muscle blood volume immediately post-stimulation[4]. Concerning spinal flexibility, finger-floor distance (FFD) improved due to shiatsu stimulation of the dorsal region[5], as did standing forward flexion due to shiatsu stimulation of the abdominal and inguinal regions[6]. We have shown that shiatsu stimulation acts on the circulatory system, affects standing forward flexion, and increases spinal range of motion by alleviating muscle tension[5-10].

Tazuke et al[6] reported that shiatsu stimulation to the gluteal region and posterior lower limb significantly improved spinal mobility, standing forward flexion, and sacral angle of inclination. In this study, we investigate whether spinal mobility is affected when the area of shiatsu stimulation is limited to the gluteal region alone. Furthermore, because a human being's center of gravity is located slightly anterior to the second sacral vertebra[11], it can be hypothesized that, when the incline of the sacrum is changed due to shiatsu stimulation, this also affects the line of gravity. We investigate this issue as well in this report.

II. Methods

1. Subjects

Research was conducted on 20 male students of th Japan Shiatsu College (average age: 35.55 ± 3.31 yeaı old). Test procedures were fully explained to each te: subject and their consent obtained.

2. Test period and location

Testing was conducted in the basic medicine researc lab at the Japan Shiatsu College between May 16 an September 19, 2009. Room temperature was 25.0 2.0°C and humidity was 68 ± 12.0%.

3. Measurement procedures

Spinal mobility and spinal inclination angle in th standing position were measured using a Spin Mouse® (Index Co., Ltd.). The line of gravity was mea sured using photographs taken using a digital cameı (Canon IXY Digital 920 IS) (Figs. 1, 2).

(1) Measurement of spinal mobility (Spinal Mouse®

The Spinal Mouse® enabled measurement of angl and range of motion of each intervertebral space o

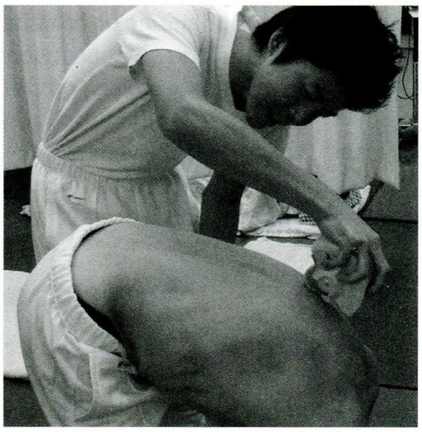

Fig. 1. Measurement using Spinal Mouse®

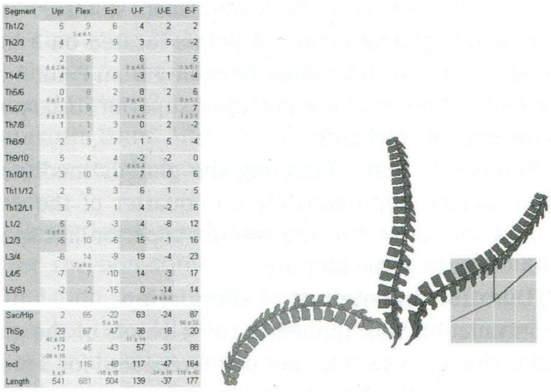

Fig. 2. Spinal ROM measurement screen

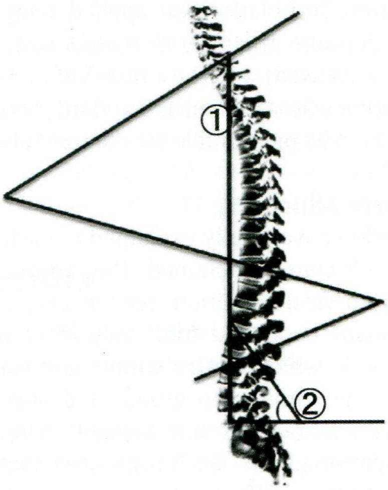

Fig. 3. Measurement items: ① Spinal inclination angle and ② Sacral/pelvic inclination angle

both the sagittal and coronal planes from the body surface.

In this study, we assessed spinal ROM on the sagittal plane using spinal inclination angle and sacral/pelvic inclination angle measured in anteflexion and dorsiflexion (Fig. 3). Anteflexion ROM is the difference between measurement values in the neutral standing and maximum anteflexion positions, and dorsiflexion ROM is the difference between measurement values in the neutral standing and maximum dorsiflexion positions. For the line of gravity, we measured the spinal inclination angle in the neutral standing position.

Measurement items are shown below.

① Spinal inclination angle: Indicates the measure of overall ROM using a straight line between the 1st thoracic vertebra and the 1st sacral vertebra. Expressed as the angle between that line and a vertical line.

② Sacral/pelvic inclination angle: The sacral inclination angle is the angle which is measured, but because the sacrum is joined to the pelvis via the sacroiliac joints, it corresponds to the pelvic inclination angle.

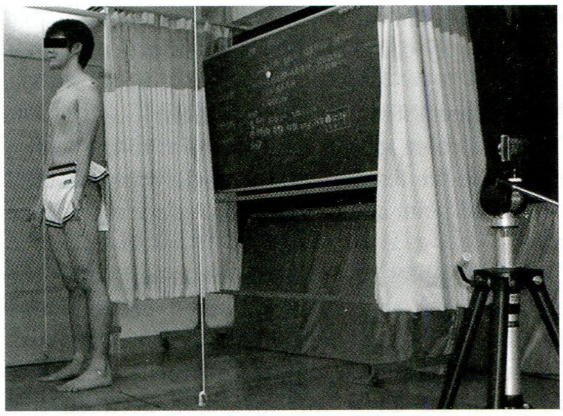

Fig. 4. Photography with digital camera

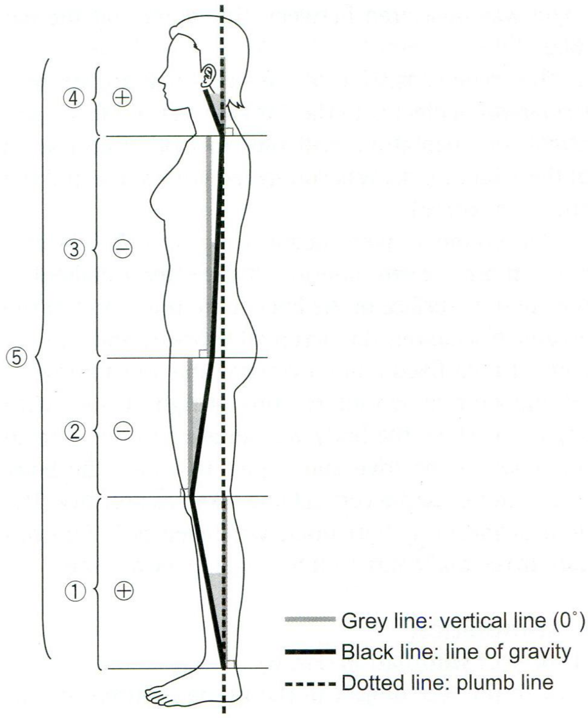

Fig. 5. Measurement items: line of gravity

(2) Measurement of line of gravity (photography using digital camera)

In order to measure the line of gravity, photographs were taken using a digital camera according to the following procedure (Figs. 4, 5). Landmark stickers were applied to the acromial process, the center of the greater trochanter, the anterior surface of the knee joint, and a point approx. 2 cm anterior to the lateral malleolus, which mark the passage of the line of gravity on the sagittal plane[12]. Two strings with weights attached (hereafter, plumb lines) were hung from the ceiling and subjects were photographed using a digital camera while standing between these lines with their limbs in the anatomical position. At this time, the plumb line was aligned using the lateral malleolus as the reference point. This is because we felt that, since other points not in contact with the floor were capable of motion, they could not be relied on as a reference point[13].

Measurement items are shown below.

① Taking a point approx. 2 cm anterior to the lateral malleolus as the fixed point, the angle was measured between this point and the anterior surface of the knee joint.

② Taking the anterior surface of the knee joint as the fixed point, the angle was measured between this point and the center of the greater trochanter.

③ Taking the center of the greater trochanter as the fixed point, the angle was measured between this point and the acromial process.

④ Taking the acromial process as the fixed point, the angle was measured between this point and the ear lobe.

⑤ The angle consisting of the sum of all angles from the lateral malleolus to the ear lobe (①, ②, ③, ④) was calculated (hereafter, malleolus-to-lobe angle). Each of these landmarks was connected with a line and the angles measured.

Measurements were taken using fixed points at a point approx. 2 cm anterior to the lateral malleolus, the anterior surface of the knee joint, the center of the greater trochanter, the acromial process, and the ear lobe. At each fixed point a vertical line and a horizontal line were drawn intersecting at right angles, with angles in which the body was anterior to the vertical line taken as positive and angles in which the body was posterior to the vertical line taken as negative. The vertical line, 90° to horizontal, was taken as 0°. For evaluation, the malleolus-to-lobe angle (⑤) was used.

4. Stimulation

(1) Area of stimulation (Fig. 6)

With the test subject in the prone position, stimulation was applied using thumb-on-thumb pressure to the 4 points of the gluteal region and the single Namikoshi Point, as per basic Namikoshi shiatsu.

4 points, gluteal region: 4 points located on a line along the gluteus maximus, extending from Point 1 on the lateral border of the posterior superior iliac spine to the greater trochanter.

Namikoshi Point: Targeting the gluteus medius, 1 point located approximately one quarter of the way along a line connecting the anterior superior iliac spine with the base of the sacrum[8].

(2) Duration and method of stimulation

Stimulation was applied to the 4 points of the gluteal region for 3 seconds per point, repeated for 3 minutes, then to the Namikoshi Point for 5 seconds per application, repeated for 2 minutes. This was repeated bilaterally for a total stimulation period of 10 minutes duration. Stimulation was applied using standard pressure (pressure gradually increased, sustained, and gradually decreased), and the amount of pressure used in stimulation was classified as standard (pressure regulated so as to be pleasurable for the test subject).

5. Test procedure (Fig. 7)

Test procedures were fully explained to each test subject and their consent obtained. They were also questioned on physical condition, regular exercise habits, and dominant hand and foot. Two tests were performed, one in which shiatsu stimulation was applied (hereafter, the stimulation group) and one in which shiatsu stimulation was not applied (hereafter, the non-stimulation group). Both tests were applied to all 20 test subjects on different days.

(1) Stimulation group

Test subjects rested with eyes closed for 10 minutes in the supine position. The Spinal Mouse® was used to measure spinal range of motion in anteflexion and dorsiflexion, along with spinal angle of inclination in the neutral standing position. Photographs were taken using a digital camera showing side views from both sides. After measurement, shiatsu stimulation was

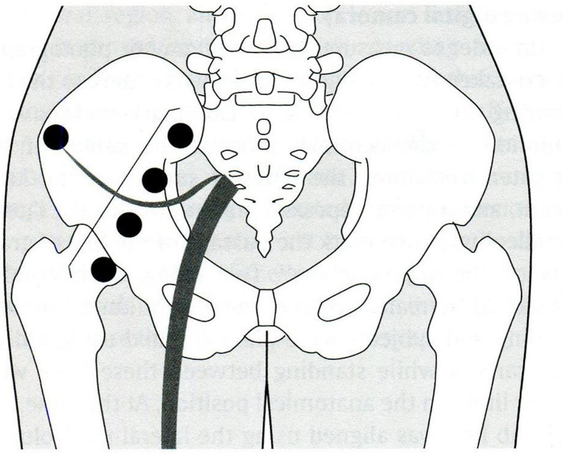

Fig. 6. Area of stimulation

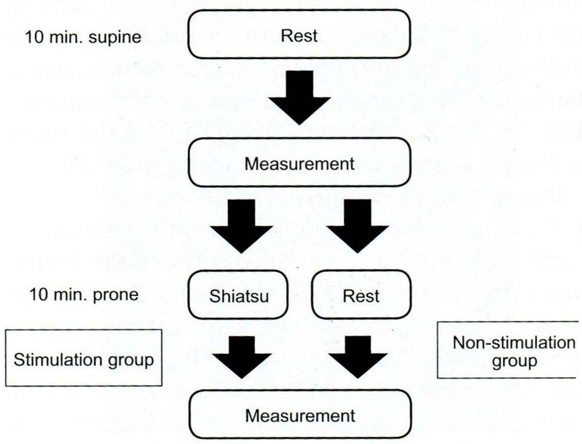

Fig. 7. Test procedure

applied for a total of 10 minutes in the prone position, consisting of 3 minutes to the left gluteal region, 2 minutes to the left Namikoshi Point, 3 minutes to the right gluteal region, and 2 minutes to the right Namikoshi Point. After stimulation, the same measurements were taken using the Spinal Mouse® and digital camera.

(2) Non-stimulation group

For the non-stimulation group, instead of shiatsu stimulation, test subjects rested for 10 minutes in the prone position. All other procedures were the same as for the stimulation group.

6. Statistical processing

Using SPSS Ver.15 software, pre/post-stimulation measurement values from the Spinal Mouse® and digital camera were analyzed using Fisher multiple comparison and two-way analysis of variance using a general linear model. Each pre/post-stimulation comparison was also compared using Fisher multiple comparison and one-way analysis of variance. A significance level of ≤5% was determined to be significant.

III. Results

1. Spinal ROM in anteflexion (Fig. 8)

(1) Changes to sacral/pelvic inclination angle in anteflexion

In the non-stimulation group, anteflexion was almost unchanged, measuring 57.32 ± 3.01° (mean ± SE) pre-stimulation vs. 57.16 ± 3.28° post-stimulation. In the stimulation group, there was a trend toward an increase, measuring 58.50 ± 3.72° pre-stimulation vs. 59.70 ± 4.30° post-stimulation, but a statistically significant variation was not observed.

(2) Changes to spinal inclination angle in anteflexion

In the non-stimulation group, anteflexion was almost unchanged, measuring 107.95 ± 3.48° pre-stimulation vs. 108.00 ± 3.31° post-stimulation. In the stimulation group, there was a trend toward a decrease, measuring 109.40 ± 3.38° pre-stimulation vs. 108.50 ± 3.23° post-stimulation, but a significant variation was not ascertained.

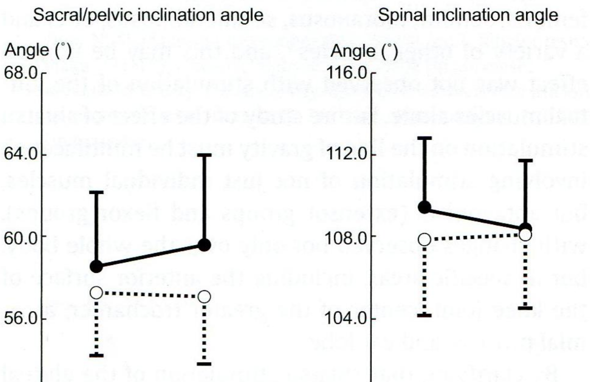

Fig. 8. Anteflexion ROM sacral/pelvic inclination angle and spinal inclination angle for non-stimulation and shiatsu stimulation groups

2. Spinal ROM in dorsiflexion (Fig. 9)

(1) Changes to sacral/pelvic inclination angle in dorsiflexion

In the non-stimulation group, dorsiflexion was almost unchanged, measuring 21.37 ± 2.83° pre-stimulation vs. 21.95 ± 2.94° post-stimulation. In the stimulation group, dorsiflexion was almost unchanged, measuring 22.10 ± 2.28° pre-stimulation vs. 22.10 ± 2.37° post-stimulation.

(2) Changes to spinal inclination angle in dorsiflexion

In the non-stimulation group, there was a trend toward a decrease, measuring 39.21 ± 2.69° pre-stimulation vs. 38.05 ± 3.04° post-stimulation, but a significant

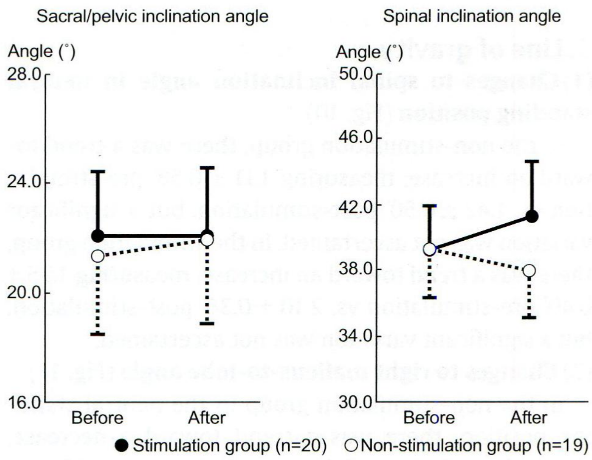

Fig. 9. Dorsiflexion ROM sacral/pelvic inclination angle and spinal inclination angle for non-stimulation and shiatsu stimulation groups

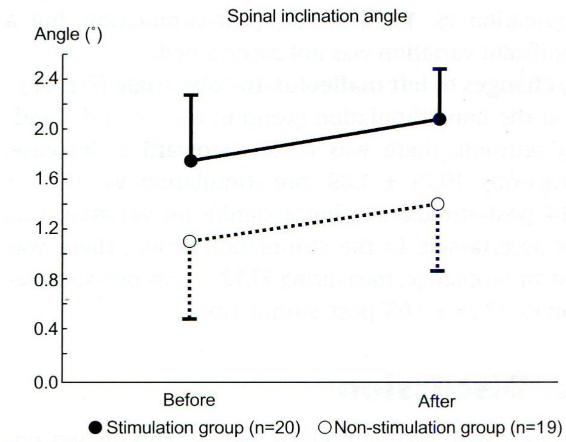

Fig. 10. Neutral standing spinal inclination angle for non-stimulation and shiatsu stimulation groups

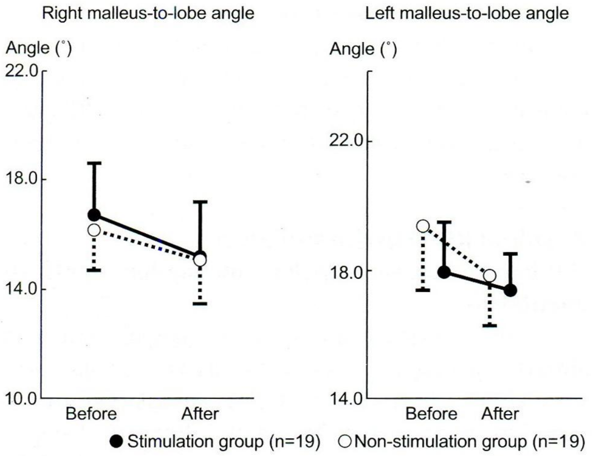

Fig. 11. Neutral standing left and right lateral lines of gravity for non-stimulation and shiatsu stimulation groups

variation was not ascertained. In the stimulation group, there was a trend toward an increase, measuring 39.10 ± 2.78˚ pre-stimulation vs. 41.35 ± 3.17˚ post-stimulation, but a significant variation was not ascertained.

3. Line of gravity

(1) Changes to spinal inclination angle in neutral standing position (Fig. 10)

In the non-stimulation group, there was a trend toward an increase, measuring 1.11 ± 0.58˚ pre-stimulation vs. 1.42 ± 0.50˚ post-stimulation, but a significant variation was not ascertained. In the stimulation group, there was a trend toward an increase, measuring 1.75 ± 0.49˚ pre-stimulation vs. 2.10 ± 0.36˚ post-stimulation, but a significant variation was not ascertained.

(2) Changes to right malleus-to-lobe angle (Fig. 11)

In the non-stimulation group in the neutral standing position, there was a trend toward a decrease, measuring 16.16 ± 1.34˚ pre-stimulation vs. 15.11 ± 1.64˚ post-stimulation, but a significant variation was not ascertained. In the stimulation group, there was a trend toward a decrease, measuring 16.74 ± 1.86˚ pre-stimulation vs. 15.32 ± 1.86˚ post-stimulation, but a significant variation was not ascertained.

(3) Changes to left malleolus-to-lobe angle (Fig. 11)

In the non-stimulation group in the neutral standing position, there was a trend toward a decrease, measuring 19.21 ± 1.89˚ pre-stimulation vs. 17.63 ± 1.44˚ post-stimulation, but a significant variation was not ascertained. In the stimulation group, there was almost no change, measuring 17.72 ± 1.54˚ pre-stimulation vs. 17.28 ± 1.08˚ post-stimulation.

IV. Discussion

At the Japan Shiatsu College, we are conducting ongoing research into the effects of shiatsu stimulation on spinal mobility, reporting on which regions of the body produce improved mobility in response to shiatsu stimulation and which have no effect. Tazuke et al[6] reported that shiatsu stimulation of the gluteal region and posterior lower limb resulted in significant improvement of spinal mobility, standing forward flexion, and sacral inclination angle, while Eto et al[5] reported that improved spinal mobility was not observed with shiatsu stimulation of the interscapular and subscapular regions.

In this study, shiatsu stimulation of the gluteal region did not result in significant change, either in the stimulation group or the non-stimulation group, to any of the measurement items, including ROM in anteflexion, ROM in dorsiflexion, and spinal inclination angle and bilateral line of gravity in the neutral standing position.

Whereas the gluteus maximus—the muscle stimulated during shiatsu stimulation of the gluteal region—is employed in large motions such as climbing stairs, the hamstrings work to support the hip joints when the trunk is leaning forward in activities such as washing one's face over a sink, so it is thought that the hamstrings are under tension more frequently in everyday use[9]. Therefore, the hamstrings should be more actively involved as a factor influencing spinal mobility. This may be the reason why shiatsu stimulation to the gluteal region had no effect on spinal mobility.

The fact that shiatsu stimulation to the posterior lower limb effects changes in spinal mobility[6] suggests that, not only the hamstrings, but also the triceps surae may be involved. Further research is required to determine the relationships of the hamstrings and triceps surae to spinal mobility.

Concerning the line of gravity, ideally a person's balance in the neutral standing position is maintained by tension in tendons and the triceps surae, but in reality, maintaining balance in response to gravity and other external forces requires the interaction of the anti-gravity muscles (erector spinae, gluteals, biceps femoris, semimembranosus, semitendinosus, etc.) and a variety of other muscles[12], and this may be why an effect was not observed with stimulation of the gluteal muscles alone. Future study of the effect of shiatsu stimulation on the line of gravity must be multifaceted, involving stimulation of not just individual muscles, but antagonists (extensor groups and flexor groups), with changes observed not only over the whole body, but in specific areas, including the anterior surface of the knee joint, center of the greater trochanter, acromial process, and ear lobe.

By clarifying that shiatsu stimulation of the gluteal region has no effect on spinal mobility, the results of this study suggest that shiatsu stimulation to the posterior lower limb plays an important role in affecting spinal mobility.

V. Conclusions

Shiatsu stimulation to the gluteal region performed on 20 healthy, adult male test subjects yielded the following results:

1. No significant change was observed to sacral/pelvic inclination angle or spinal inclination angle in anteflexion or dorsiflexion.
2. No significant change was observed in spinal inclination angle or bilateral line of gravity in the neutral standing position.

In closing, we would like to express our appreciation to the instructors and students of the Japan Shiatsu College who participated in this research.

References

1 Koyata S et al: Shiatsu shigeki ni yoru shinjunkankei ni oyobosu koka ni tsuite. Toyo ryoho gakko kyokai gakkaishi 22: 40-45, 1998 (in Japanese)

2 Ide Y et al: Ketsuatsu ni oyobosu shiatsu shigeki no koka. Toyo ryoho gakko kyokai gakkaishi 23: 77-82, 1999 (in Japanese)

3 Kamohara H et al: Massho junkan ni oyobosu shiatsu shigeki no koka. Toyo ryoho gakko kyokai gakkaishi 24: 51-56, 2000 (in Japanese)

4 Asai S et al: Shiatsu shigeki ni yoru kin no junansei ni taisuru koka. Toyo ryoho gakko kyokai gakkaishi 25: 125-129, 2001 (in Japanese)

5 Eto T et al: Shiatsu shigeki ni yoru kin no junansei ni taisuru koka (dai 3 ho). Toyo ryoho gakko kyokai gakkaishi 27: 97-100, 2003 (in Japanese)

6 Tazuke M et al: Shiatsu shigeki ni yoru sekichu no kadosei oyobi kin no katasa ni taisuru koka. Toyo ryoho gakko kyokai gakkaishi 28: 29-32, 2004 (in Japanese)

7 Miyachi M et al: Fukubu shiatsu shigeki ni yoru sekichu no kadosei ni taisuru koka. Toyo ryoho gakko kyokai gakkaishi 29: 60-64, 2005 (in Japanese)

8 Ishizuka H et al: Shiatsu ryohogaku: 40-102, International Medical Publishers, Ltd. Tokyo, 2008 (in Japanese)

9 Neumann D A; Shimada T, Hirata S (tr. supervision): Kinkokkakukei no kineshioroji. Ishiyaku Publishers, Inc.: 432-440, Tokyo, 2006 (in Japanese)

10 Iwakura H: Rigakuryohoshi no tame no undoryoho. Kanehara & Co., Ltd.: 25-26, 1991 (in Japanese)

11 Yoshinari K et al: Sokeibu shiatsu shigeki ga sekichu kadosei ni oyobosu koka. Toyo ryoho gakko kyokai gakkaishi 32: 18-22, 2008 (in Japanese)

12 Dohi N; Shadanhojin toyoryohogakko kyokai (ed.): Rihabiriteshon igaku: 141-143, Ishiyaku Publishers, Inc. 2008 (in Japanese)

13 Kendall, McCreary, Provance; Kayamori R (tr. supervision): Kin kino to tesuto—shisei to itami—: 70-74, Tokyo, Nishimura Co., Ltd. 2006 (in Japanese)

Effect on Pupil Diameter, Pulse Rate, and Blood Pressure of Shiatsu Stimulation to the Sacral Region

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I. Introduction

The Japan Shiatsu College has previously reported in the Journal of the Japan College Association of Oriental Medicine on the effects of shiatsu stimulation on heart rate[1–4], blood pressure[1–4], peripheral circulation[3], and electrogastrograph activity[4–6], in order to help clarify its effects on the autonomic nervous system. Two years ago, we began studying the effect of shiatsu stimulation on pupil diameter, and have shown that shiatsu stimulation of the abdominal and anterior cervical regions result in significant reduction in pupil diameter[7,8].

In this report, building on the results of previous reports, we will study the effect on pupil diameter of shiatsu stimulation to the sacral region, while at the same time measuring blood pressure and pulse rate.

II. Methods

1. Subjects

Research was conducted on 22 students and instructors at the Japan Shiatsu College, 13 male and 9 female (average age: 35.5 ± 7.5 years old). Test procedures were fully explained to each test subject and their consent obtained and histories taken prior to testing.

2. Test period and location

Testing was conducted in the basic medicine research lab at the Japan Shiatsu College between April 28 and July 7, 2012. Room temperature was 22 ± 2.0°C and humidity was 79 ± 15.0%. Illumination was 100 lux.

3. Measurement procedures

Changes in pupil diameter were measured using a binocular electronic pupillometer (Newopto Corp. ET-200, Fig. 1), with the test subject in the prone position. A continuous blood pressure manometer (Japan Colin Jentow-7700, Fig. 2) was used to derive blood pressure and pulse rate (heart rate) from the right radial artery using tonometry.

4. Stimulation

Area of stimulation (Fig. 3)

With the test subject in the prone position, stimulation was applied using two-thumb pressure to the 3 points of the sacral region, as per basic Namikoshi shiatsu.

Treatment consisted of standard pressure applications of 3 seconds per point, applied to both bilateral points simultaneously, and repeated for 3 minutes duration. Stimulation was applied using standard

Fig. 1. Binocular electronic pupillometer

Fig. 2. Continuous blood pressure manometer

pressure (pressure gradually increased, sustained, and gradually decreased), regulated so as to be pleasurable for the test subject.

5. Test procedure (Figs. 4, 5)

Test procedures were fully explained to each test subject and their prior consent obtained. They were also questioned on physical condition and history of eye disease.

Pupil diameter was measured for 9 minutes, divided into 3 minutes pre-stimulation, 3 minutes shiatsu stimulation, and 3 minutes post-stimulation (hereafter, the stimulation group). Also, in the control group (hereafter, the non-stimulation group), pupil diameter was measured for 9 minutes with the subjects in a relaxed state in the same prone position as the stimulation group. These interventions were carried out on all 22 test subjects on different days.

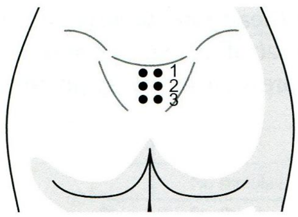

Fig. 3. Shiatsu points of the sacral region

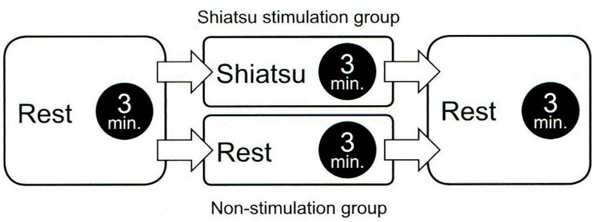

Fig. 4. Test procedure

Fig. 5. Measurement using pupillometer and continuous blood pressure manometer

For measurement of pupil diameter, test subjects were made to fix their gaze on a 1.5 cm diameter mark affixed to the floor 80 cm away from the goggles.

6. Data analysis

Taking pupil diameter 60 seconds prior to stimulation (Bf.60) as the control, data was analyzed for 5 seconds at 30-second intervals during stimulation (St.) and post-stimulation (Af.).

7. Statistical processing

Post-stimulation chronological pupil diameter, heart rate, and blood pressure values for both groups (stimulation group, non-stimulation group) were analyzed using Bonferroni multiple comparison and mixed model analysis of variance. A significance level of <5% was determined to be significant.

III. Results

1. Pupil diameter (Fig. 6)

Both groups (stimulation group, non-stimulation group) displayed an interaction effect post-stimulation in chronological changes on the left side (p=0.02) and the right side (p=0.023).

With shiatsu stimulation of the sacral region, right pupil diameter was contracted at 90 seconds post-stimulation (p=0.007), as compared to pre-stimulation (cont.). Left pupil diameter was unchanged. In the non-stimulation group, both left and right pupil diameter were unchanged.

2. Pulse rate (heart rate) (Fig. 7)

Both groups (sacral region shiatsu stimulation group, non-stimulation group) displayed an interaction effect post-stimulation in chronological changes to pulse rate (p=0.00).

With shiatsu stimulation of the sacral region, pulse rate was reduced at 60 seconds (p=0.011), 120 seconds (p=0.045), and 150 seconds (p=0.045) during stimulation and immediately post stimulation (p=0.029), as compared to pre-stimulation (cont.) values. In the non-stimulation group, there was no chronological change.

3. Blood pressure (Fig. 7)

Both groups (sacral region shiatsu stimulation group, non-stimulation group) displayed an interaction effect post-stimulation in chronological changes to systolic blood pressure (p=0.015), but there was no interaction effect for diastolic blood pressure.

With shiatsu stimulation of the sacral region, systolic blood pressure was elevated at 90 seconds (p=0.014), 120 seconds (p=0.001), and 150 seconds (p=0.003) post stimulation, as compared to pre-stimulation (cont.) values. There was no chronological change in diastolic blood pressure. In the non-stimulation group, there was no chronological change in either systolic or diastolic blood pressure.

IV. Discussion

In this study, no significant change in pupil diameter was ascertained in the non-stimulation group, but significant contraction of pupil diameter did occur in the group receiving shiatsu stimulation to the sacral region.

It has been reported that pupil dilation occurs in response to pain stimulation[9], however we may assume that a dilation response did not occur in this study because subjects received standard shiatsu stimulation unaccompanied by pain.

Pupil diameter is regulated by the dilator pupillae muscle, which is controlled by the sympathetic nervous system (cervical sympathetic nerves), and by the sphincter pupillae muscle, which is controlled by the parasympathetic nervous system (oculomotor nerve). The pupil contraction response due to shiatsu stimulation observed in this study may have occurred as a result of either excitation of the parasympathetic nervous system, which controls the sphincter pupillae muscle, suppression of sympathetic nervous system, which controls the dilator pupillae muscle, or a combination of the two.

It has been indicated in the past that the sympathetic nervous system is involved in pupillary responses involving the higher brain centers[10, 11], but Ohsawa et al[12] and Shimura et al[13] showed that reflexive pupil dilation occurs in light-adapted, anesthetized rats due to electro-acupuncture and pinch stimulation, and is unaffected by severing of the cervical sympathetic nerves, confirming that dilation occurs due to suppression of the parasympathetic nervous system. They also reported on the important role the parasympathetic nervous system plays in the pupillary response in reaction to somatosensory stimulation.

In reports of the previous two years, we showed that significant contraction of pupil diameter occurs due to shiatsu stimulation of the anterior cervical and abdominal regions. In this report, we have also shown that a significant contraction response similarly occurs with shiatsu stimulation of the sacral region.

Reduction of pulse rate (heart rate) occurred due to shiatsu stimulation of the sacral region. This may have resulted from either suppression of the sympathetic

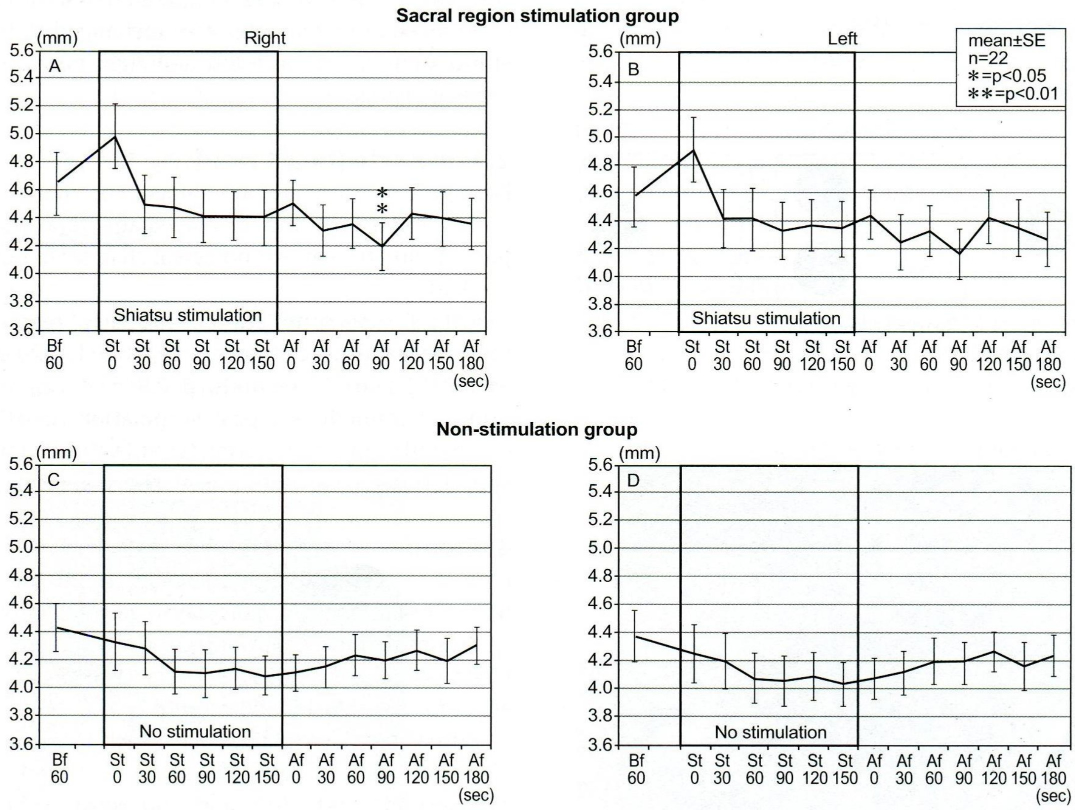

Fig. 6. Changes to pupil diameter due to shiatsu stimulation of the sacral region
A: Right pupil (sacral region stimulation group), B: Left pupil (sacral region stimulation group), C: Right pupil (non-stimulation group), D: Left pupil (non-stimulation group). On each graph, the vertical axis represents pupil diameter (mm) and the horizontal axis represents elapsed time (sec), with mean ± SE displayed. Bf: pre-stimulation (control); St: during stimulation; Af: post-stimulation

nerves or accentuation of the parasympathetic nerves controlling the heart, or a combination of the two. Previous reports from the Japan Shiatsu College have shown that shiatsu stimulation to the anterior cervical, abdominal, and lower leg regions reduces heart rate[1–4]. The observation that, similar to these areas, shiatsu stimulation of the sacral region also reduces pulse rate (heart rate) would seem to suggest that this reduction response is generalized throughout the body.

With regard to the blood pressure response to shiatsu stimulation, we have previously reported that shiatsu stimulation to the anterior cervical, abdominal, and lower leg regions elicits a depressor response[2], however in this study involving shiatsu stimulation to the sacral region an increase in systolic pressure was observed. As in the report by Ide et al[2], subjects in this study received standard shiatsu unaccompanied by pain, and measurement items other than blood pressure indicated contraction of pupil diameter and a reduction response for heart rate. Consequently, the increase in blood pressure accompanying shiatsu stimulation of the sacral region may have been a transitory one, due to light pressure exerted on the abdominal aorta while pressure application was conducted in the prone position. Further research on this phenomenon is required.

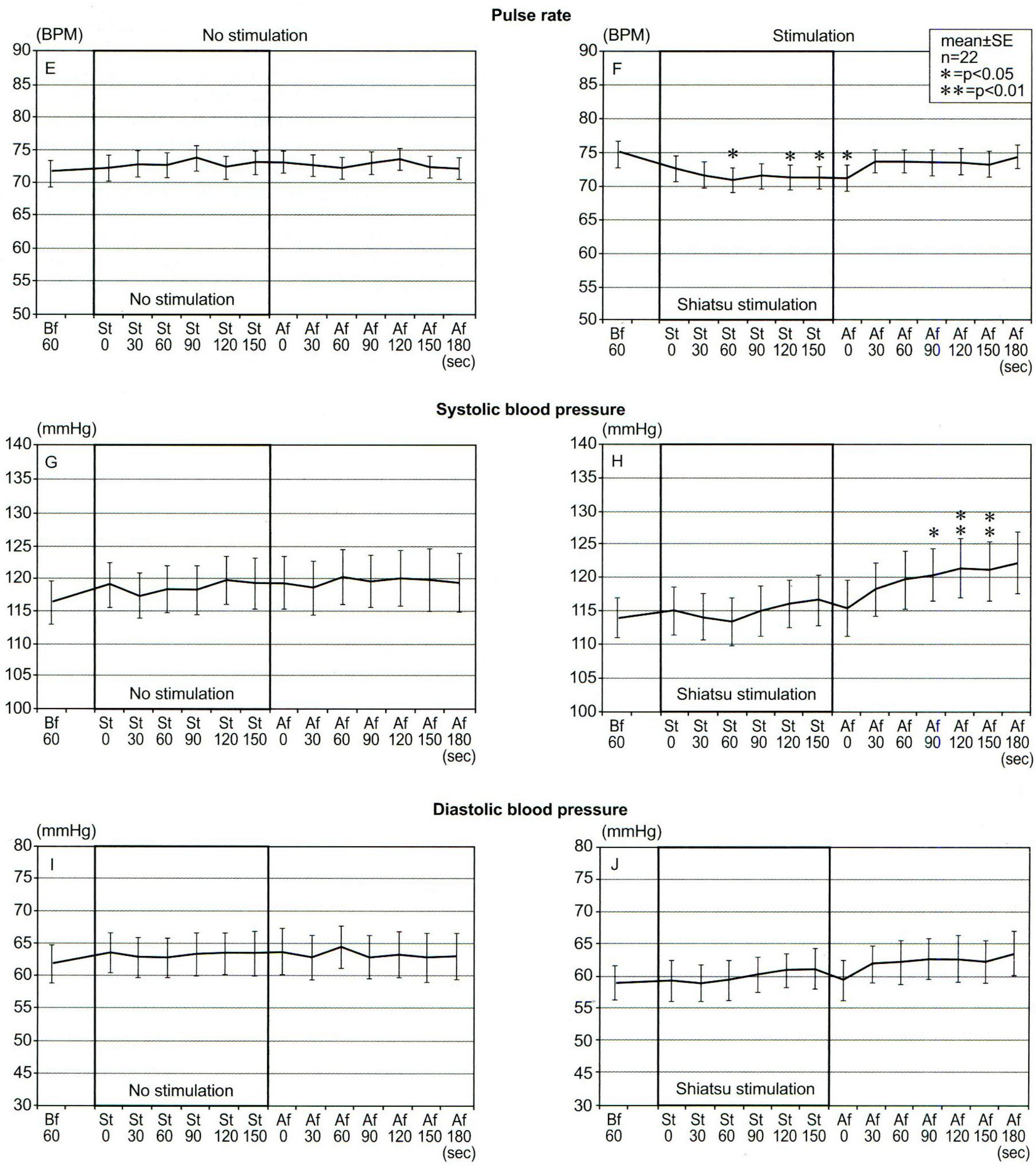

Fig. 7. Changes to pulse rate and blood pressure due to shiatsu stimulation of the sacral region

V. Conclusions

From this study performed on healthy adults, the following is evident:

1. Shiatsu stimulation resulted in significant post-stimulation contraction of pupil diameter.
2. Shiatsu stimulation resulted in significant post-stimulation increase in systolic blood pressure, but no significant response in diastolic blood pressure was observed.
3. Shiatsu stimulation resulted in significant reduction of pulse rate (heart rate) during and after stimulation.

In closing, we would like to express our appreciation to the instructors and students of the Japan Shiatsu College who participated in this research.

References

1 Koyata S et al: Shiatsu shigeki ni yoru shinjunkankei ni oyobosu koka ni tsuite. Toyo ryoho gakko kyokai gakkaishi 22: 40-45, 1998 (in Japanese)
2 Ide Y et al: Ketsuatsu ni oyobosu shiatsu shigeki no koka. Toyo ryoho gakko kyokai gakkaishi 23: 77-82, 1999 (in Japanese)
3 Kamohara H et al: Massho junkan ni oyobosu shiatsu shigeki no koka. Toyo ryoho gakko kyokai gakkaishi 24: 51-56, 2000 (in Japanese)
4 Kato R et al: Zenkeibu shiatsu shigeki ga jiritsu shinkei kino ni oyobosu koka. Toyo ryoho gakko kyokai gakkaishi 32: 75-79, 2008 (in Japanese)
5 Sato K et al: Katai shiatsu shigeki ni yoru idenzu no henka. Toyo ryoho gakko kyokai gakkaishi 30: 34-38, 2006 (in Japanese)
6 Kurosawa K et al: Fukubushiatsu shigeki ni yoru idenzu no henka. Toyo ryoho gakko kyokai gakkaishi 31: 55-58, 2007 (in Japanese)
7 Kurihara K et al: Fukubu shaitsu shigeki ga dokochokkei ni oyobosu koka. Toyo ryoho gakko kyokai gakkaishi 34: 129-132, 2010 (in Japanese)
8 Yokota M et al: Zenkeibu • katai gaisokubu no shiatsu shigeki ga dokochokkei ni oyobosu koka. Toyo ryoho gakko kyokai gakkaishi 35: 77-80, 2011 (in Japanese)
9 Oono S: Pharmacological studies on pupillary reflex dilation. J Pharmacol 15: 91-112, 1965
10 Ward AAJ, Reed HL: Mechanism of pupillary dilation elicited by cortical stimulation. J Neurophysiol 9: 329-335, 1946
11 Lowenstein O, Loewenfeld IE: Role of sympathetic and parasympathetic systems in reflex dilation of the pupil: pupillographic studies. Arch Neurol Psych 64 (3): 313-340, 1950
12 Ohsawa H, Yamaguchi S, Ishimaru H et al: Neural mechanism of pupillary dilation elicited by electro-acupuncture stimulation in anesthetized rats. J Auton Nerv Syst 64 (2-3): 101-6, 1997
13 Shimura M, Ohsawa H, Tomita A, Sato A: Hifu shingai shigeki ni yoru hanshasei dokohanno. Jiritsushinkei 37 (5): 584-590, 2000 (in Japanese)